

Strategies for Watershed Management

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Foreword

Stream management should really be termed watershed management. This approach better describes where opportunities to improve our water resources exist. These resources include streams, lakes, reservoirs, groundwater, wetlands, springs, sinkholes, and all of the associated biotic and abiotic forms associated with them. Often we tend to focus management efforts on the water resource directly, forgetting the interconnectivity of all the parts of the watershed that make the resource sustainable over the long term.

A stream system and all of the land that drains into it is called a watershed. A watershed approach addresses the five elements of a watershed. These are: the uplands, the floodplains, the riparian corridors, ground water, and the stream channels. The uplands shed water and sediment down the slopes and when fully functional, maintain a natural deliver rate of each to the stream. The floodplain is the portion of the valley floor submerged by flood waters during periods of heavy runoff; to be fully functional it should be sufficiently vegetated and available to the stream at high flow events. The riparian (stream side) corridor is a continuous strip of land that parallels both sides of the stream. This strip of land is very important because, when properly vegetated, it buffers the stream from the rest of the watershed and provides important fish and wildlife habitat functions. This is true even in headwater streams, which may not have a floodplain. Precipitation infiltration throughout the watershed recharges groundwater and reduces flooding during wet seasons. In turn, groundwater is essential to a watershed by providing base flows to some stream channels during dry periods. Stream channels convey water and sediment down the valley and if they and their watersheds are mostly unaltered, they provide natural habitats. The channels are the smallest portions of the watersheds but often receive the most attention, yet the condition of the stream channel is primarily a reflection of its watershed (uplands, floodplains, riparian corridors, and groundwater) and the activities occurring within it.

The watershed management approach is a multi faceted strategy, as there are numerous, often conflicting interests and land use practices that are occurring across multiple spatial and temporal scales. Thus, a long term perspective is necessary to managing land and water resources. Landowners and other stakeholders should be considered in a comprehensive management plan. Highly contentious or technically complex issues in watersheds such as instream flow, contaminants, impoundments, etc. may need the additional support of the Stream Program Coordinators and/or Policy Coordination. This document outlines Fisheries Division strategies for prioritizing and working within watersheds.

All of the State's watersheds are important but they cannot all be addressed simultaneously; therefore a prioritization process is necessary which includes both watersheds that have been designated as aquatic-oriented Conservation Opportunity Areas (ACOA's) and those that have not. Concentrating on priority watersheds will allow more time to get local citizens participating in and taking ownership of their watershed's health. With leadership and support from the local public, our collaborative role is to serve as a catalyst, provide education, technical expertise (science), and assist with administration including identifying partners and resources. There are many decisions to be made throughout the watershed strategy development process. Each step of this process should follow structured decision making:

- Problem Definition- What is the management decision that needs to be made? What is the timeline and geographic scope of the topic?
- What are the objectives and how well have they been formed by stakeholder involvement? If stakeholder input is yet to be obtained, proceed with the discussion with the understanding that this input must be gained before final management decisions should be made. It is not uncommon to go through this collaborative process once to obtain the benefits of brainstorming in preparation for

obtaining stakeholder input. However, a more thorough final decision making process must occur after obtaining appropriate stakeholder input. Objectives should be quantifiable and trigger points should be set for initiating subsequent actions.

- Brainstorm all the possible management actions and the associated consequences of those actions. In this brainstorming session identify and deal with the uncertainty of the topic, gauge the risk of the various alternatives and make decisions on the tradeoffs.
- Take the time to look beyond the scope of your immediate topic to evaluate how your decision may affect other Department decisions, stakeholders and resources.

The basic outline of most regional watershed strategies should look something like this (Fig. 1):

- Step 1: Evaluate and Prioritize Watersheds Regionally
- Step 2: Comprehensive Watershed Characterization
- Step 3: Stakeholder Involvement
- Step 4: Goal and Objective Development
- Step 5: Strategies for Meeting Goals and Objectives
- Step 6: Acquire Resources to Implement Program
- Step 7: Implement
- Step 8: Evaluate/Monitor (and repeat steps 4-8 if necessary)

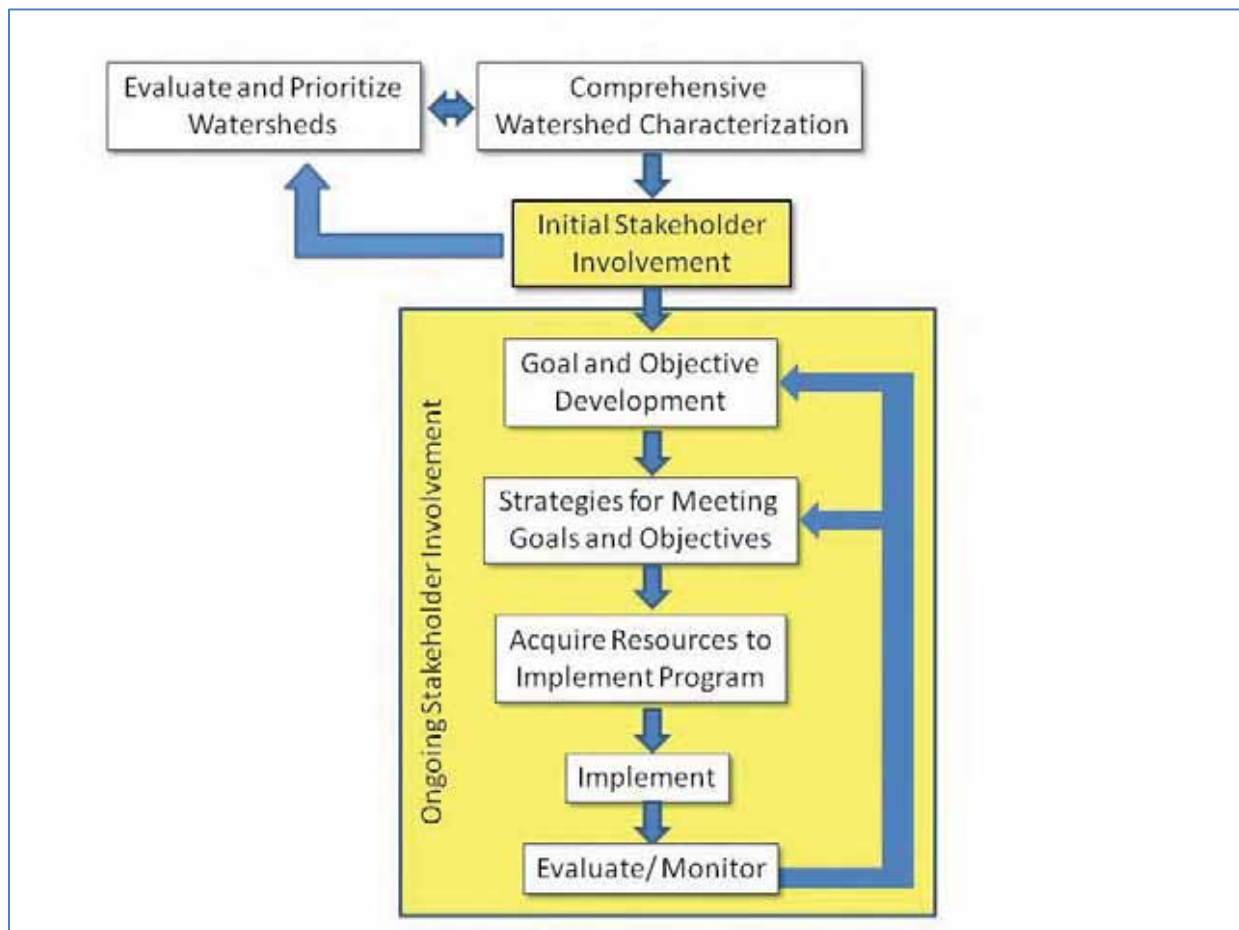


Figure 1. Regional watershed strategy step process. All steps in the yellow box require communicating with diverse watershed stakeholders and seeking their input.

Step 1: Evaluate and Prioritize Watersheds Regionally

Continued decline of aquatic biota, coupled with the limited human and financial resources dedicated to conservation, necessitates the establishment of geographic priorities. Without focus, limited resources could likely be used in a piecemeal, fragmented manner and not be sufficient to produce desired results, especially given the many other services and areas that MDC maintains.

Prioritization should begin within the regions because of regional knowledge of the local resource and stakeholders. Watersheds should be selected based on resource concerns, landowner interest, and potential partners. Watersheds that overlap regional boundaries will require effective communication and cooperation among all involved.

The overall goal of prioritizing watersheds regionally is to develop local interest across the state that will aid in the formation of citizen led watershed protection statewide. This regional prioritization approach also allows other partnering groups to align their resources with local projects which may be of primary interest to them. Many of these groups, including other agencies, continually rely on our expertise for identifying priority areas for their stream resource work.

Based on MDC's mission, the watershed prioritization should be based on two guiding objectives; conserving biodiversity, and providing quality areas and opportunities for outdoor recreation. Some significant aquatic areas have already been identified in the Conservation Wildlife Strategy process that identified 158 ACOA's based on a representation of the diversity of watersheds, aquatic systems, and species of Missouri. However, there are other watersheds that meet the biodiversity and recreational prioritization objectives that are not ACOA's; so a broader approach which includes these watersheds in the prioritization process will be necessary. Once candidate watersheds have been identified, there are other mandatory aspects that will need to be considered in the process: **1) is there enough existing local interest/participation in a designated target watershed or can interest be generated (local buy-in); 2) can the most significant watershed goals be addressed in a reasonable fashion (feasibility); and 3) can multiple priorities be met in overlapping areas?** Three considerations for candidate watersheds are listed below. *See Appendix A for Watershed Prioritization Strategies.*

ACOA's

The ACOA's offer a good starting point for consideration in the prioritization process. Regional discretion of current conditions is required in order to assume whether an ACOA should be a regional priority, and how it ranks as compared to other non-ACOA priority watersheds. The aspects of local buy in, feasibility, and overlap outlined in the above paragraph should assist in narrowing down priorities in regions with many ACOA's.

MDC Streams and Impoundments (Lakes)

Streams and impoundments (lakes) owned or managed by MDC provide public recreation opportunities and support for conservation. These lakes are heavily used and require significant management resources, both time and money, to maintain them. Significant savings from reduced sedimentation and nutrification could be achieved by considering them in the watershed prioritization process. Many watershed landowners use these areas and place a personal value on that resource, making local buy-in easier to achieve in these areas. Many of these watersheds are relatively small

compared to other priority landscapes and therefore significant outcomes from targeted watershed management may be easier to achieve.

High Profile Recreational Areas

Heavily recreated rivers and reservoirs are also areas to consider when prioritizing watersheds. These areas draw large numbers of Missouri citizens and non-residents to our water resources, which generate strong support for conservation and local economies. The visibility and importance of these areas to the public and established stakeholder groups should assist with local watershed improvement efforts. The size and condition of the watershed surrounding some of these areas could be daunting. All of these aspects must be considered in the regional prioritization process.

The outcome of this prioritization process is not meant to be an exclusive list of the only watersheds the Department will consider doing projects within. Watersheds that have existing, active stakeholder groups or those of primary interest to the region for other reasons should be included in the prioritization process. It is important to realize that not all priority watersheds will need the same amount of staff time or resources. Private and agency requests for assistance outside of priority watersheds may still be addressed, but resources will be concentrated towards target watersheds. *See Appendix B for more information on non-priority watershed stream assistance.*

Step 2: Comprehensive Watershed Characterization

Once target watersheds have initially been identified for prioritization, an inventory of existing watershed specific conditions should be conducted. This inventory should include the experience and expertise of Fisheries Division staff, working with a multidisciplinary team from MDC, state and federal agencies, and local interests familiar with the resources of the area. Further analysis should be conducted to verify conditions and diagnose watershed changes that may affect these conditions. Comparison of time series aerial imagery and topographic maps using GIS, along with driving through the watershed and documenting on the ground conditions should be done first. This inventory offers a generalized view of the watershed's current and recent past conditions. All physical, biological, and chemical data that is available for the watershed over time should be taken into account and included. *See Appendix C for Comprehensive Watershed Characterization.* Some candidate priority watersheds may be lacking biological and or water quality data required to make a good assessment of current conditions, if so, further inventories may need to be conducted. *(See Appendix G for Monitoring and Assessment Strategies and Techniques.)* The results of this data gathering and review process can be compared with existing WIA's management plans to see if the opportunities and goals are still relevant to that watershed (sub-watershed). If not, the new goals identified should be used to update the watershed's WIAs, as these will become valuable reference tools for watershed groups and funding sources like the Stream Stewardship Trust Fund (SSTF). The results of this characterization will help to identify the management and policy issues that will need to be addressed or trigger a re-prioritization of the watershed.

Another important part of characterizing the watershed is using human dimensions and census data to understand the history, culture, and memes of the citizens that live in the watershed and may influence their behaviors. Instructions on how to gather and use this data are included in *Appendix E*.

Step 3: Stakeholder Involvement

Before involving local stakeholders, it is important to understand the human dimension of a watershed. This includes understanding the social attitudes, cultural history, and behaviors that helped to shape the land use of the watershed over time. An important part of human dimensions is not just collecting the data through

census information and other sources, but listening to watershed landowners, considering their goals and concerns for their own communities and resources. Early information sharing efforts within the watershed are required before the results of the historical, physical, biological and chemical characterization are communicated with the local stakeholders. This includes familiarizing stakeholders with basic watershed principles and defining terminology that may be used throughout the process to reduce misconceptions and confusion. Local stakeholders could include landowners, county commissions, water municipalities, road and bridge workers (MODOT and County), agricultural associations, city boards, etc. Fundamentals on how to coordinate an effective watershed-based program can be found in “Achieving Private-Sector Involvement and its Implications for Resource Professionals”, and “Getting in Step: Engaging and Involving Stakeholders in Your Watershed” *see Appendix D*. Contacting Stream Teams within the watershed to encourage their involvement and help identifying other stakeholders is also an important step. *See Appendix E for more information on Effective Marketing Techniques*.

Continuing the many important aspects of this step throughout the watershed management process cannot be emphasized enough. A lack of stakeholder or landowner involvement and agreement should trigger the need to re-evaluate and adjust marketing approach or, if necessary, drop a watershed to a lower level of prioritization.

Step 4: Goal and Objective Development

The results of the regional watershed characterizations should help to identify and define goals and objectives, but stakeholder involvement is crucial in this step. There must be local participation and ownership in forming the goals and objectives for the watershed. The results of the characterization can be used to help direct attention to goals, but ultimately it will have to be a mutual goal of the watershed landowners and resource agencies/stakeholders to be successful. Remember that the goals will be the overall intentions for the watershed project and the objectives will be the precise steps needed to meet the goals.

All watershed project goals should ultimately address ecosystem health and resiliency. These are a product of connectivity, diversity, and temporal dynamics of ecosystem processes. Connectivity refers to the unimpeded movement of abiotic and biotic factors in an upstream and downstream direction; as well as, connectivity of the stream to riparian corridors, floodplains and groundwater. Conserving diversity requires attention to a broad perspective of abiotic and biotic factors from geologic features to vegetative, invertebrate and vertebrate species in the watershed. Addressing temporal dynamics in a watershed entails first identifying the varying conditions needed at specific times and locations to accommodate the interwoven life cycles of aquatic organisms; and then assessing potential or current threats to those conditions. The objectives to reach ecosystem health and resiliency goals will be vast and varied. Most objectives should attempt to influence one or more of the five factors of stream biotic health listed by Karr et al. (1986), those being: water chemistry, stream flow, physical habitat, biotic interactions, and energy sources. Long-term goals and objectives such as maintaining aquatic biodiversity will require a longer-term assessment than is commonly associated with grants and other funding sources. Short-term objectives related to altering sources of stressors within the watershed should be developed for most grants and similar funding sources.

Step 5: Strategies for Meeting Goals and Objectives

Management activities and practice development should specifically address the watershed objectives identified in Step 4.

Practices: Protection, Enhancement, and “Restoration”

The most effective and cost efficient way to achieve watershed health is to protect areas that are already functional, healthy and intact. The second method would be to enhance areas that could easily be rehabilitated to provide full watershed function. Typically, the least effective and cost efficient methods of achieving watershed-wide health are in-channel “restoration” efforts. As such, watershed project practices should reflect these principles. The term restoration infers that an area can be brought back to its original unaltered state. Most restoration efforts in stream literature would more aptly be referred to as renovations rather than restorations, as a completely new condition is created with the intent of providing functions that were assumed to have been there before alterations.

Protection

A large majority of protection practices will be in the form of watershed wide educational efforts. These efforts should be watershed-specific, explaining the causes of the existing condition both spatially and temporally, and how to best protect the watershed. Other examples of practices that would fall under protection would be riparian protection easements, greenways, storm water codes, sewer and septic standard codes, etc. Even though these practices often take a long time to accomplish and are not very showy; ultimately it is these protection practices that should be emphasized because they are the foundation of long term watershed health.

Enhancement

Enhancement practices can be used in conjunction with protection practices (i.e. educational efforts, riparian easements, and riparian corridor re-establishment). Again, by developing practices around specific watershed conditions, results are more readily achieved. Examples of enhancement projects include improving and restoring riparian buffers, livestock fencing, alternative watering, improving roads, retrofitting existing wastewater facilities, removing fish passage barriers, grade control, etc. These projects require large scale landowner participation in order to have marked watershed results.

“Restoration”/Renovation

In-channel restoration/renovation practices should be considered only after the causes of the adverse stream conditions have been addressed successfully. These practices tend to treat the symptoms rather than the cause, and therefore do little to improve watershed health when used without widely adopted protection and enhancement practices. Examples of these practices include structural stream bank stabilization, in-stream habitat structures, and reach channel restorations/renovations. Often, these practices are unnecessary if protection and enhancement practices are successfully implemented and the system is allowed to recover on its own. *Refer to Stream Improvement Certification and Rock-Based Bank Stabilization and Grade Control Policies when considering these practices Appendix H.*

Step 6: Acquire Resources to Implement Program

Because of the specificity of the objectives and practices that may be unique to a given watershed, new resources outside of, and in addition to, existing programs may need to be acquired. The watershed group should work together to research grants, donors, and other potential sources of support for the program. *See Appendix F for links to potential funding resources.*

Step 7: Implement

An implementation plan should also be developed to pinpoint targets within a watershed where specific practices should be used. These practices developed with a marketing process, will then need to be

successfully administered to their target audience. *(Refer back to Appendix E for Effective Marketing Techniques if necessary.)*

Step 8: Evaluate (and repeat steps 4-8 if necessary)

Monitoring and evaluating the watershed project is an essential step to this entire effort. With monitoring much can be learned from project successes and failures, which will aid in prospective watershed projects. Monitoring and evaluation should be focused primarily on management efforts, stakeholder participation/satisfaction, and watershed condition. A straightforward method of monitoring is to monitor the sign up rate for practices in a target watershed. A more difficult way attempts to demonstrate a measurable change in the target watershed's conditions, presumably from the new watershed practices. This could be a direct measure of the condition, or an indirect measure, such as biological monitoring, or both. Ideally, both of these monitoring and evaluation techniques would be done prior to the installment of the watershed project practices, as well as at certain time periods within the project. Because watershed-specific practices will vary from one watershed to the next, monitoring protocols may be somewhat different depending on the outcomes to be measured. Another important evaluation is stakeholder satisfaction. The outcome of this evaluation can help to streamline current and future stakeholder watershed management building efforts. *For Monitoring and Assessment Strategies and Techniques see Appendix G.*

Conclusion

By prioritizing watersheds, MDC can take a proactive approach in establishing cooperation amongst stakeholders by offering watershed-specific education, assistance, and resources. Every watershed project is likely to be somewhat unique, which requires flexibility and innovation. To facilitate regional staff with the adoption of this approach to watershed management, various training courses will be developed and provided. This approach not only allows local citizens to be responsible for their stream resources, it also provides more partnering opportunities in the way of financial resources. Some watershed projects may not get off of the ground because of lack of common local interests. Others may already be well on their way, with little need of MDC's assistance. Because of this, it is important to remember that this is a dynamic process that must continually be re-evaluated for relevance within a watershed with regards to the interest of all of the watershed stakeholders. It is also important to remember that this document and especially its appendices, which contain the strategies of watershed management, should be considered living documents and updated with new and more relevant information as it becomes available.

Literature Cited

Karr, James R., K.D. Fausch, P.L. Angermeier. P.R. Yant, I.J. Schlosser. 1986. Assessing Biological Integrity in Running Waters a Method and its Rationale. Illinois Natural History Survey. Special Publication 5.

APPENDIX A: WATERSHED PRIORITIZATION STRATEGIES

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- 1) **Background/Need:** Continued decline of aquatic biota, coupled with the limited human and financial resources dedicated to conservation, necessitates the establishment of geographic priorities (i.e., need to identify focus areas). Without focus, limited resources could likely be used in a piecemeal, fragmented manner and not be sufficient to produce desired results, especially given the many other services and areas that MDC maintains.
- 2) **Purpose/Goal:** The process for prioritizing watershed conservation must be flexible enough to account for the diversity of situations and resources which exist across the state but definitive enough to allow regional staff to feel confident in their commitment of MDC resources. Therefore, these guidelines help define the process, yet flexibility and discretion of their use by the regions is expected. Also, the outcome of this prioritization process is not meant to be an exclusive list of the only watersheds within which the Department will consider doing projects. Private and agency requests for assistance outside of priority watersheds will still be addressed (Appendix B), but MDC resources will be concentrated towards priority watersheds.
- 3) **Objectives:** Based on MDC's mission, watershed prioritization should be based on two guiding objectives; conserving biodiversity, and providing quality areas and opportunities for outdoor recreation.
 - a) **Biodiversity objectives:** Some significant aquatic biodiversity areas have already been identified in the Comprehensive Wildlife Strategy process that identified 158 aquatic-oriented Conservation Opportunity Areas (ACOA) based on a representation of the diversity of watersheds, aquatic systems, and species of Missouri. Due to the large number of ACOAs, MDC can not realistically conserve all of them at one time; however, we must make steady progress towards protecting the aquatic biodiversity in as many ACOAs as possible. Therefore, the original list of ACOAs needs to be examined for relevancy, adjusted as appropriate, and then a subset of a manageable number should be identified as priority ACOAs for focus and commitment of MDC resources.
 - i) **ACOA watersheds**
 - (1) See executive summary of Nigh (2005) for the fundamental principles and processes that guided ACOA selection (MDC Sharepoint, Resource Science). See summary by D. Figg for definitions of Comprehensive Wildlife Strategy (CWS) vocabulary (MDC Sharepoint, Resource Science).
 - (2) **Checking for Relevance and Changing of an ACOA:** A currently selected ACOA may no longer be an appropriate option to meet its objective. Possible reasons could include extreme changes in land use preventing realistic opportunities for conservation, or Aquatic Gap Model inaccuracies of species distribution. If analysis of prioritization criteria suggest an ACOA to be in such condition and a very low priority, it may be appropriate to recommend another ACOA be selected to represent its particular aquatic ecological system (AES). Further administrative guidance is needed to coordinate with the CWS for the changing of an ACOA.
 - ii) **Species Of Conservation Concern (SOCC) watersheds**
 - (1) For example, federally endangered species legally require conservation action. A watershed conservation approach is usually critical to aquatic species conservation, so these watersheds will likely be high priority.
 - b) **Recreational fisheries objectives:**
 - i) **MDC Streams and Lakes** - Streams and lakes owned or managed by MDC provide public recreation opportunities and support for conservation. These lakes are heavily used and require significant management resources, both time and money, to maintain them. Significant savings from reduced sedimentation and nutrification could be achieved by considering them in the watershed prioritization process. Many watershed landowners use these areas and place a personal value on that resource, making local buy-in easier to achieve in these areas. Many of these watersheds are relatively small compared to other priority landscapes and therefore may have more significant outcomes from targeted watershed management.
 - ii) **High Profile Recreational Areas** -Heavily recreated rivers and reservoirs are also areas to consider when prioritizing watersheds. These areas draw large numbers of Missouri citizens and residents from other states to our water resources, which generate strong support for conservation and local economies. The visibility and importance of these areas to the public and established stakeholder groups could assist with

watershed improvement efforts. The size and condition of the watershed surrounding some of these areas could be daunting. All of these aspects must be considered in the regional prioritization process.

c) Statewide administrative guidance for objectives:

- i) Because MDC Regions are human political boundaries, MDC staff distribution and assignments may not be geographically concentrated in the same proportions as watershed conservation priorities. Therefore, each region may need to adjust staff distribution, their work assignments, or priority watershed selections to achieve appropriate workloads for available staff and budgets.
- ii) A review from a statewide perspective also may be needed to confirm that the highest priority and/or a desired distribution of watersheds are selected for conservation action. For the biodiversity objective, **regions should communicate with each other to ensure selection of one watershed from each Ecological Drainage Unit or Pflieger's Aquatic Faunal Regions and their Divisions (see attached map)**. The coverage of a given percentage of all target species may be also appropriate for a statewide objective and review. For a recreational objective, ensuring selection of each type of fishery within a region, or coverage of the best statewide examples may be appropriate.
- iii) To effectively plan and implement management strategies, watersheds should not be of too large of size. Documentation shows that a 30,000-acre (or a HUC 12) watershed (or a watershed with less than 80 landowners) is about as large as can be effectively managed. If a larger watershed is a priority, effort should be focused within one or a few smaller subwatersheds at one time until all subwatersheds are addressed (e.g., Middle Meramec River COA). In this manner, cumulative objectives for the larger watershed can be achieved over time. An exception to this approach might be when critical strategies are very few and focused, for example, aquatic organism passage barrier removal within range of the Niangua darter.

4) **Watershed Prioritization Criteria and Process:** These criteria are split into three categories; the first pertinent to a biodiversity objective, the second pertinent to a recreational fishery objective, and the third possibly applicable to both objectives. This is not a complete list of all possible criteria that could be considered, nor is each criterion stated in great detail. Some criteria are intentionally ambiguous **thus local knowledge, discretion, and adaptation of criteria are important and expected for best use**. The matrix attached is an example of how to visually compile and organize known watershed information and it is not meant to produce a rank or score. Additions or deletions of selection criteria may be necessary depending on regional discretion. Below are the details of the criteria included in the example matrix.

a) **Biological Criteria for Biodiversity Objective:** Because the objective is biodiversity conservation, this portion is based on measures of biodiversity, as was done with the initial selection of the ACOAs. The initial selection of ACOAs considered the biodiversity along with the amount of public land and human stressors within the areas (Nigh, 2005). The criteria below are options for further prioritizing watersheds based on their biodiversity.

- **Total Number of Predicted Species for the Watershed:** This is the number of fish, crayfish, and mussel species predicted by the MORAP Aquatic Gap project model which was derived from MDC and other fish collection data correlated with extensive physical data on watershed geology, stream size, stream temperature, and stream flow (Sowa et al, 2007). More species predicted for a watershed should suggest a greater value and therefore priority for conservation. Keep in mind that this data is specific only to Aquatic Ecological Systems (AES) and include an area much larger than the targeted watershed of interest. (For instructions see Guide sheet #8 in Appendix C).
- **Total Number of Targeted Species for Watershed:** Targeted species are a subset of predicted species which are: a) endemic or characteristic of the Ecological Drainage Unit (EDU); b) species of concern (federal and state listed species); or c) play an important/unique ecological role per Pflieger (1989). More target species within a watershed should suggest a greater value and therefore priority for conservation. Again, this data is specific only to AESs and include an area much larger than the targeted watershed of interest. (For instructions see Guide sheet #8 in Appendix C).
- **Irreplaceability Values:** The definition of irreplaceability is "the likelihood that a given site will need to be protected to achieve a specified set of targets or, conversely, the extent to which options for achieving these targets are reduced if the site is not protected" (Diamond, 2005). This value helps identify critical locations where conservation action will provide the greatest initial return for the effort expended. Again, this data is specific only to AESs and include an area much larger than the targeted watershed of interest. MORAP data based on native fish, crayfish, and mussel species were used for the analyses. (For instructions see Guide sheet #9 in Appendix C).

- Current Biological Condition: IBI score or other biological health assessment value to give higher priority to most healthy watersheds. This criterion would only apply where these scores are already available unless further sampling is conducted.
- b) **Criteria for Recreational Objective:** These criteria can help prioritize areas for watershed management activities to conserve recreational fisheries. With this objective, the first prioritization “cut” should be based on the three components of a sport fishery: the sport fish population(s), the watershed-scale habitat, and the recreational users. The criteria below are options for further prioritizing watersheds based on recreation.
- Quality of Sport Fish Population: Based on PSD and RSD values, MDC survey CPUE, angler CPUE, etc.
 - Designated as a Special Management Area (SMA) or “Trophy” fishery (e.g., red or blue ribbon trout area, smallmouth bass SMA, other unique fishery).
 - New or unique management activities being implemented (e.g., angler regulation, fish stocking)
 - Importance to Anglers: Based on angler effort or opinions measured with creel surveys, etc.
 - Economic Importance: Based on economic value of angler trips, marinas, guide services, canoe liveries, etc.
 - Land use: Percent of the watershed (area affecting the biological objective) in natural vegetation (usually wooded or native grassland) and/or in public ownership to indicate condition of watershed and level of protection available. (For instructions see Guide sheet #2 in Appendix C)
 - Unaltered or minimally altered physical attributes (e.g., 1) appropriate stream size, stream gradient, stream temperature, spring contribution to flow for smallmouth bass fishery, minimal channelization or other channel alterations, or 2) watershed ratio, maximum depth, etc. for lake fishery) to support species biological objectives.
 - Do planned management activities for the watershed have a holistic approach without encouraging just a few species?
- c) **Other Criteria for Biodiversity and/or Recreational Objectives:** Specific categories are not required for criteria below, although some categories (e.g. high medium, low) are offered as examples. Each region could assign its own categories based on local circumstances and knowledge.
- Human Threat Data: Latest spatial Aquatic Gap data on potential threats statewide. Each threat can be mapped within the watershed. Caution must be used as some threats are listed by address of business and not necessarily source of stress and visa versa, so verification may be necessary. (For instructions see Guide sheet #3 in Appendix C).
 - Immediacy of Threats: Best professional judgment if threats are immediate, near, distant, or non-existent.
 - Permanency of Threats: Best professional judgment of the realistic and practical ability to reverse the impact of the threats.
 - Ability to Develop and Sustain Social and Political Will: Based on survey results if available, or based on other insight to stakeholder attitudes and desires from experience.
 - Multiple Aquatic Resource Priorities Addressed: Number of other aquatic resource priorities that also exist within the watershed (e.g., species of concern, special management areas, ACOA, relatively close stream connectivity with another priority watershed).
 - Potential Partners: Significance or level of contribution of partners for conservation funding, planning, projects, etc.

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Diamond, D. 2005. Development of conservation focus area models for EPA Region 7. Regional geographic initiative report. Missouri Resource Assessment Partnership. Columbia, Missouri, USA.

Nigh, T.A. 2005. Missouri Department of Conservation aquatic biodiversity assessment. Missouri Department of Conservation, Jefferson City, Missouri, USA.

Pflieger, W.L. 1989. Aquatic community classification system for Missouri. Aquatic Series Number 19. Missouri Department of Conservation, Jefferson City, Missouri, USA.

Sowa, S.P., G. Annis, M.E. Morey, and D.D. Diamond. 2007. A gap analysis and comprehensive conservation strategy for riverine ecosystems of Missouri. Ecological Monographs. 77:301-334.

Possible Priority Watershed Selection Criteria	
Biological Criteria for Biodiversity Objective	Total Number of Predicted Species for Watershed: Based on MORAP Aquatic Gap Model derived from MDC fish collection data, this data is only available for designated ACOAs (<u>note: this data is derived from AES units which are likely larger areas than the targeted watershed of interest</u>).
	Total Number of Targeted Species for Watershed: Subset of Predicted Species which is endemic or characteristic of the EDU, a species of concern, or play an important/unique ecological role per Pflieger (<u>note: this data is derived from AES units which are likely larger areas than the targeted watershed of interest</u>) .
	Irreplaceability Values: MORAP data for fish, crayfish, mussels, and total (<u>note: this data is derived from AES units which are likely larger areas than the targeted watershed of interest</u>). This data is only available for ACOA's
	Current Biological Condition: IBI score or other biological health assessment value to give higher priority to most healthy watersheds (if available).
Criteria for Recreational Objective	Quality of Sport Fishery Population: Based on PSD and RSD values, MDC survey CPUE, angler CPUE, etc. if available.
	Designated as a Special Management Area (SMA) or "Trophy" fishery (e.g., red or blue ribbon trout area, smallmouth bass SMA, other unique fishery).
	New or unique management activities being implemented (e.g., angler regulation, fish stocking).
	Importance to Anglers: Based on angler effort or opinions measured with creel surveys, etc.
	Economic Importance: Based on economic value of angler trips, marinas, guide services, canoe liveries, etc. (High, Med, or Low)
	Landuse: Percent of watershed in natural vegetation and/or in public ownership.
	Unaltered or minimally altered physical attributes (e.g., stream size, stream gradient, stream temperature, spring contribution to flow) to support species biological objectives.
	Do planned management activities for the watershed have a holistic approach without encouraging just a few species?
Other Criteria for Biodiversity and/or Recreational Objectives	Human Threat Data: Latest spatial Aquatic Gap data mapped within watershed for number and location of threats in database.
	Immediacy of Threats: Best professional judgment if threats are immediate, near, or distant.
	Permanency of Threats: Best professional judgment of the realistic and practical ability to reverse the impact of the threats.
	Ability to develop and sustain social and political will based survey results and other insight to stakeholder attitudes and desires.
	Multiple Aquatic Resource Priorities Addressed: Number of other aquatic resource priorities that also exist in the watershed (e.g. species of concern, special management areas, ACOA, stream connectivity with other priority watershed).
	Potential Partners: Contribution of partners for conservation funding, planning, projects, etc.

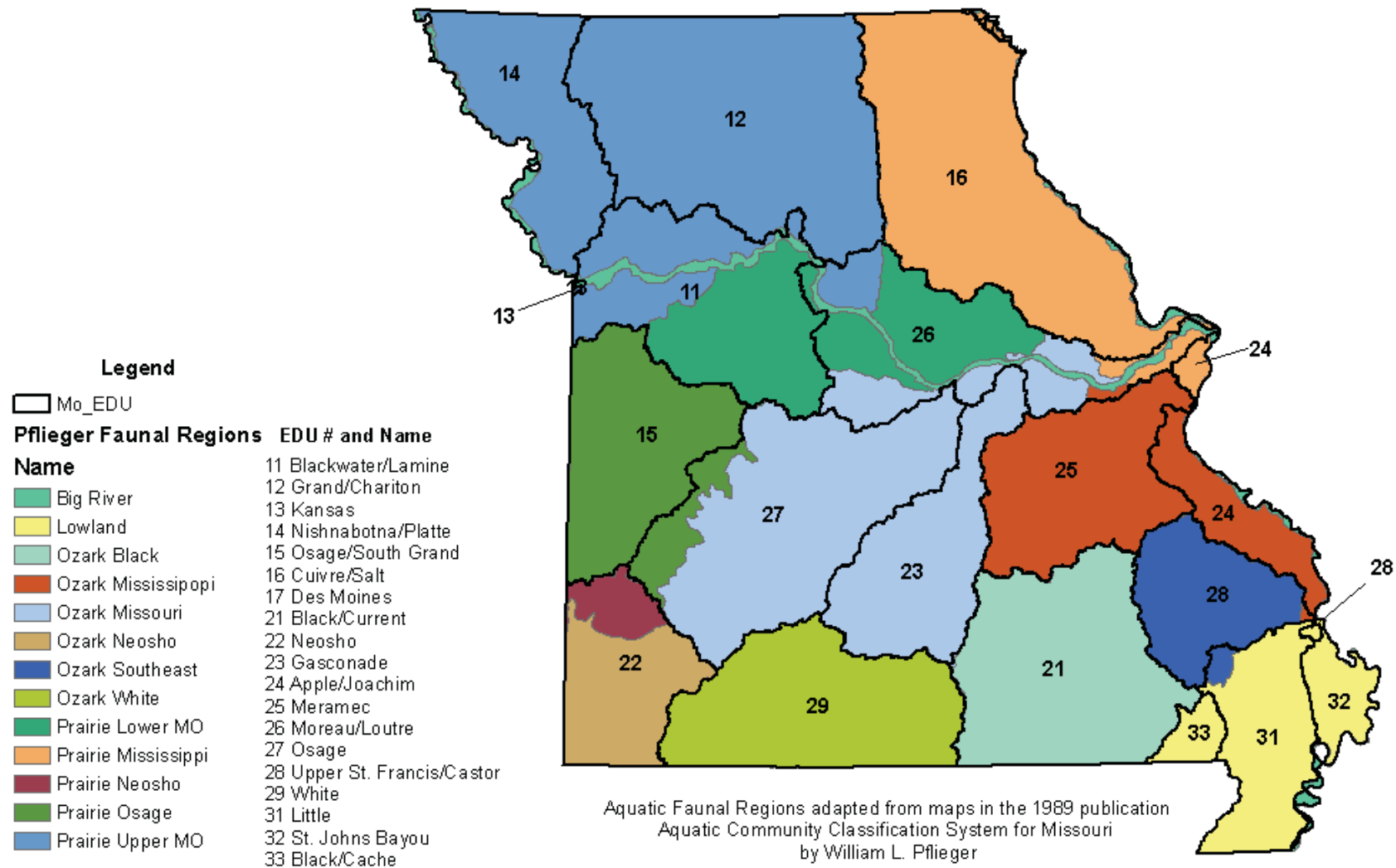
Possible Priority Watershed Selection Criteria Worksheet:

Watershed Name					
Watershed Area in sq miles					
Biological Criteria for Biodiversity Objective	Total Number of Predicted Species for Watershed				
	Total Number of Targeted Species for Watershed:				
	Irreplaceability Values: Fish, Crayfish, Mussels, Total (only available for COAs)				
	Current Biological Condition: IBI score or other biological health assessment value (if available).				
Criteria for Recreational Objective	Quality of Sport Fishery Population: PSD and RSD values, MDC survey CPUE, angler CPUE, etc.				
	Designated as a Special Management Area (SMA) or "Trophy" fishery (e.g. red or blue ribbon trout area, smallmouth bass SMA, other unique fishery).				
	New or unique management activities being implemented (e.g. angler regulation, fish stocking).				
	Importance to Anglers: Angler effort and opinions. (High, Med, or Low)				
	Economic Importance: Based on economic value of angler trips, marinas, guide services, canoe liveries, etc. (High, Med, or Low)				
	Landuse: Percent of watershed in natural vegetation and/or in public ownership.				
	Unaltered or minimally altered physical attributes (e.g., stream size, stream gradient, stream temperature, spring contribution to flow) to support species biological objectives.				
	Do planned management activities for the watershed have a holistic approach without encouraging just a few species? (Yes or No)				
Other Criteria for Biodiversity and/or Recreational Objectives	Human Threat Index (use map and denote # and kind of threats)				
	Immediacy of Threats. (Immediate, near, or distant)				
	Permanency of Threats. (Irreversible, long-term, short-term)				
	Ability to develop and sustain social and political will based survey results and other insight to stakeholder attitudes and desires. (High, Med, or Low)				
	Number of Other Aquatic Resource Priorities Addressed.				
	Contribution of Potential Partners.				

Possible Priority Watershed Selection Criteria Example Worksheet:

Watershed Name		Watershed A	Watershed B	Watershed C	Watershed D
Watershed Area in sq miles		52m	100m	86m	30m
Biological Criteria for Biodiversity Objective	Total Number of Predicted Species for Watershed	45	37	35	52
	Total Number of Targeted Species for Watershed:	2	2	3	3
	Irreplaceability Values: Fish, Crayfish, Mussels, Total (only available for COAs)	N/A	F:.0057, M:.0003, C:.003, T:.009	F:.0060, M:.0001, C:.003, T:.0091	N/A
	Current Biological Condition: IBI score or other biological health assessment value (if available).	N/A	N/A	N/A	N/A
Criteria for Recreational Objective	Quality of Sport Fishery Population: PSD and RSD values, MDC survey CPUE, angler CPUE, etc.	High	High	Medium	N/A
	Designated as a Special Management Area (SMA) or "Trophy" fishery (e.g. red or blue ribbon trout area, smallmouth bass SMA, other unique fishery).	No	No	Yes	No
	New or unique management activities being implemented (e.g. angler regulation, fish stocking).	No	No	Yes	No
	Importance to Anglers: Angler effort and opinions. (High, Med, or Low)	High	High	High	High
	Economic Importance: Based on economic value of angler trips, marinas, guide services, canoe liveries, etc. (High, Med, or Low)	Med	Low	High	Med
	Landuse: Percent of watershed in natural vegetation and/or in public ownership.	22%	~15%	30%	<10%
	Unaltered or minimally altered physical attributes (e.g., stream size, stream gradient, stream temperature, spring contribution to flow) to support species biological objectives.	High	Medium	Medium	Low
	Do planned management activities for the watershed have a holistic approach without encouraging just a few species? (Yes or No)	Yes	Yes	Yes	Yes
Other Criteria for Biodiversity and/or Recreational Objectives	Human Threat Index (use map and denote # and kind of biggest threats)	50 headwater impoundments, 3 abandoned coal mines, 4 major dams, 10% high pesticide use, low impervious, low channelization, one CAFO	60 headwater impoundments, 2 Superfund sites, 16 active coal mines, 10 NPDES, medium impervious	35 headwater impoundments, 6 major dams, 5 NPDES, 1 airport, 3-303D listings	65 headwater impoundments, high channelization, 15-303D listings, 6 CAFO's, 40% high pesticide use
	Immediacy of Threats. (Immediate, near, or distant)	N/A	Distant	Near	Immediate
	Permanency of Threats (Irreversible, long-term, short-term)	N/A	Long term	Short term	Irreversible
	Ability to develop and sustain social and political will based survey results and other insight to stakeholder attitudes and desires. (High, Med, or Low)	?	?	High	Low
	Number of Other Aquatic Resource Priorities Addressed .	3	2	0	2
	Contribution of Potential Partners.	Significant	Medium	Medium	Low

Comparison of Aquatic Faunal Regions and Ecological Drainage Units



Aquatic Faunal Regions Described

Big River This faunal region includes the Missouri and Mississippi Rivers and the adjacent standing waters that are subject to frequent flooding by these rivers.

Lowlands This faunal region encompasses the alluvial plains of the bootheel of Missouri and generally has less than 10 feet of surface relief.

Ozark This faunal region includes all of Missouri south of the Missouri River bounded by the Lowlands Faunal Region to the southeast and the Prairie Faunal Regions to the north and west and contain the following divisions.

Ozark Black This division includes all streams of the Black River System within the Ozark Uplands Physiographic Region.

Ozark Mississippi This division includes direct tributaries of the Mississippi River from the Meramec system south to Cape Girardeau.

Ozark Missouri This division includes all streams of the Ozark Region that drains into the Missouri River.

Ozark Neosho This division includes all streams of the Neosho drainage (Arkansas River System) in Southwest Missouri excluding northern tributaries of the Spring River System.

Ozark Southeast This division includes streams of the St. Francis and Headwater Diversion stream system.

Ozark White This division includes all streams of the White River Drainage in the southern Ozarks.

Prairie This faunal region includes most of Missouri north of the Missouri River and a wedge shaped area south of the river along the Kansas state line and contains the following divisions.

Prairie Lower Missouri This division includes prairie streams that are direct tributaries to the lower Missouri River, upstream and to and including Perche Creek north of the Missouri River and the Lamine/Blackwater south of the Missouri River.

Prairie Mississippi This division includes all streams that drain into the Mississippi River upstream from the mouth of the Missouri River.

Prairie Neosho This is a very small division of the Prairie Faunal Region. It includes the Little North Fork and North Fork of the Spring River drainage.

Prairie Osage This division includes all of the Osage drainage that occurs in the Prairie Region.

Prairie Upper Missouri This division includes all streams of the Missouri River drainage west of Perche Creek and the Lamine/Blackwater systems.

Appendix B: Stream Assistance on Non-Priority Watersheds

Darren Thornhill, Tom Priesendorf, Jerry Wiechman

All watersheds in Missouri have great value and each should be managed to promote responsible and sustainable land uses; however, limited resources restrict our (MDC) staff from providing technical assistance to all those requesting help. This fact requires us to prioritize watersheds and focus our resources where the greatest conservation benefits may be realized. Understanding this, we must provide some level of assistance to various interest groups (e.g., USCOE, MODOT, NRCS, municipalities, landowners, legislators, user groups, etc.) as stream issues arise in non-priority watersheds. Our technical support to other resource agencies has long been a valued tradition, and our involvement in 404/401 permits, gravel mining issues, bridge replacements, aquatic organism passage barrier removal and other important developments should remain a priority. The key is determining what level of assistance is appropriate for each unique issue *when requests for assistance occur on non-priority streams*.

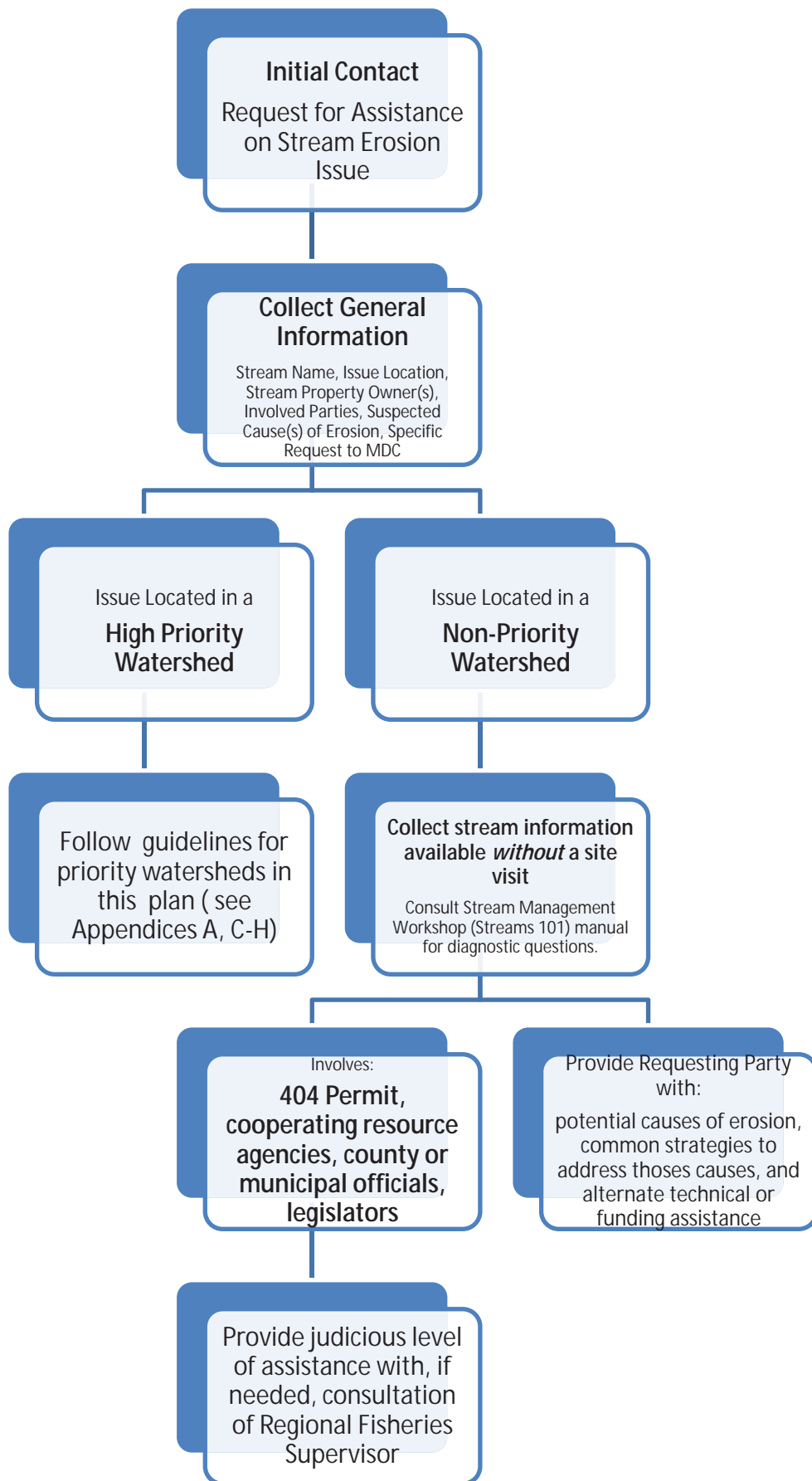
For guidance on responses to fish kills or pollution reports in non-priority watersheds consult the MDC Fish Kill/Pollution Response Policy.

The majority of the state lies outside of the boundaries of MDC's priority watersheds, therefore, the majority of non-MDC generated requests are likely to come from landowners in non-priority watersheds. Despite this fact, regions should not be routinely providing substantial assistance within non-priority watersheds as most of our resources will be devoted to priority watersheds. Remember that while we may not be able to devote much time or money to many of these requests, each contact is an opportunity to educate interested parties on general causes and solutions to streambank erosion. Sometimes this can be handled over the phone or with a letter, and does not always require an onsite visit. These contacts should also be referred to Private Lands Conservationists to help guide them through programs that other agencies may be able to provide to assist them (ie. NRCS CP22, EQIP, etc).

Many requests for stream assistance involve a desire for streambank stabilization. Streambank erosion is a natural process in streams as they attempt to balance changes in movements of water and sediment from the surrounding watershed. Structural streambank stabilization is usually costly and rarely provides a good solution as it merely treats the symptom and not the cause. In fact, sometimes the stabilization moves the symptom (erosion) to other areas of the stream. Responsible bank stabilization efforts must account for the underlying cause(s) of channel instability. The costs of structural stabilization are generally not justified from a resource perspective, and therefore we should handle them as a lower priority.

To streamline the entire process of non-priority stream contacts, biologists should consult the following flow chart. There may be special exceptions that would not follow these general guidelines. Additionally, it is highly recommended that biologists consult the Stream Management Workshop (Streams 101) manual for examples of diagnostic questions to ask landowners prior to making site visits. Writing follow-up letters and plans for common, simple recommendations (e.g. excluding livestock, increasing riparian corridor width, etc...) after site visits or phone contacts can be very time consuming but is often helpful, it is recommended that when needed, biologists use a fill in form letter to provide landowners immediate recommendations (an example form letter is attached).

(See Flow Chart on next page)



PRIVATE LANDOWNER STREAM RECOMMENDATIONS

Landowner Name: _____ County: _____ Address: _____

Stream Name: _____ Watershed Size: _____

Township: _____ Range: _____ Section: _____

Biologist: _____ Date: _____

Problem Description: _____

Problem Cause: _____

Recommendations: _____

The preceding recommendations are based on the physical conditions of the site at the time of inspection and offer a reasonable approach to your problem. With any streambank erosion problem there are risks that must be assumed. Any change in physical condition or greater than expected occurrences such as extraordinary flooding, windstorms, etc. can undo even the best-designed plans.

Biologist Signature

Attachments and Enclosures: _____

Is Supplemental Information Sheet Attached: Yes _____ No _____

U.S. Army Corps of Engineers (COE) 404 Permit Required? Yes _____ No _____

If yes, notify COE of activities (see attachments).

C: _____, Fisheries Regional Supervisor

_____, Streams Unit Fisheries Staff Biologist

Appendix C: Comprehensive Watershed Characterization

Ange Corson, John Fantz, Nate Gosch, and Justin Schaefer

Using the watershed approach in stream management is crucial to identifying and addressing stream issues. All too often, focus is on the stream channel instead of the watershed as a whole (i.e., uplands, floodplains, riparian corridors, channels, and ground water). Typically, this is an inefficient method that treats the symptom instead of the real cause of stream issues. The purpose of this characterization is to provide people with the tools necessary to implement the watershed approach to stream management. This entails characterizing watersheds by using physical, biological, water quality, land use, and temporal data. This process will help highlight potential opportunity areas for protection, enhancement, and restoration within these watersheds.

GIS is a powerful tool for stream management; however, this software can be overwhelming to those with limited GIS experience. This instructional guide has been developed to enable people with little or no GIS experience to use this software to gather information for watershed projects. Employing these GIS techniques will allow biologists to familiarize themselves with their project watersheds, identify areas that need more in-depth investigation, and present meaningful information to watershed stakeholders. It is also useful for tracking watershed projects over time.

The data needed for these guides is housed on external hard drives provided to the regions. The Data Structure Layout shows the available data and paths to access it, as well as an index on the second tab with metadata. The guide sheets begin with instructions on how to build and use some basic watershed GIS projects; then the windshield tour details instructions on verifying, observing, and documenting current watershed conditions. This guide is only meant to provide the basic GIS and database tools; however, there are many datasets available that can be explored for your watershed project. Further instruction may be necessary for more in-depth and robust applications. These guide sheets build upon each other and are best used in order (i.e., Guide Sheet 2 starts where Guide Sheet 1 ends). All guide sheets will not be applicable to all situations; they are only offered as suggestions to help with common watershed project needs. This is a living document that will be updated with new technologies, data, and suggestions from staff. Please contact Stream Unit West for suggestions or questions.

Table of Contents:

Instructions for Mapping to a Drive

(Setting up your computer to read the data on an external hard drive on a different computer)

Data Structure Layout and Index

(Reference table of data, where it is located, and what it is)

Guide sheet 1. GIS Watershed Characterization

(Watershed delineation and basic characterization using GIS datasets)

Guide sheet 2. Watershed Landuse

(Using landcover data to get a basic understanding of land use in the watershed)

Guide sheet 3. Human Threat Index data

(Locating and identifying the potential human threats within the watershed)

Guide sheet 4. Creating a Windshield Tour Map

(Creating a map to road stream crossing observation points in the watershed)

Guide sheet 5. Field Notes

(Using databases and GIS to keep track of field observations)

Guide sheet 6. Displaying Aquatic Records

(Searching existing databases for biological records within a watershed)

Guide sheet 7. Generic Aquatic Organism Passage (AOP) Inventory

(An inventory sheet and database to use as a template if conducting AOP inventories in the watershed)

Guide sheet 8. Calculating Total Predicted, Targeted Species, and Habitat Suitability Index (HSI) by Aquatic Ecological System (AES)

(Instructions on how to get these biological criteria values to help prioritize in Appendix A)

Guide sheet 9. Locating Irreplaceability Values

(Instructions on how to find this biological criteria value to help prioritize in Appendix A)

Water Quality Databases List

(A list of the water quality data and sources for the state)

Instructions for Mapping to a Drive

1. Begin at the computer which houses the drive that you wish to map to. Open Windows Explorer and right click on the drive to be shared. This only needs to be done once on that computer for all other computers to be able to access the drive (skip to step 2 if this has already been done).

- a. Click on "Sharing and Security"
- b. Then click the box next to "Share this folder"
- c. Allow it to default to maximum allowed
- d. Then click O.K. at the bottom
- e. If you receive an error message you will need to contact IT to change the privileges that you have so that the drive can be shared. I recommend contacting Shaun Zimmerman as he is familiar with this process.

2. Now go to the computer(s) that are attempting to access the drive.

- a. Right click on My Network Places
- b. Select "Map network drive"
- c. In the Drive drop down menu select a letter of a drive that is not in use anywhere else (ie. Z or Y)
- d. Under the Folder menu type in `\\IT-computer # you want to get to\Drive letter from computer you want to access`. i.e. `\\IT-123456\G` (Some computers require a \$ sign after the drive letter, you will know this if that is what was displayed when the housing computer was shared)



- e. Then check the "reconnect at logon" box. Then click "Finish"

3. You should then be able to see the drive and contents in your Microsoft Explorer or My Computer and connect to it from Arc Map

4. Anytime you wish to access this drive that computer will need to be on (with portable hard drive attached). Also you may wish to change the hibernate settings so that it does not go to sleep while you are trying to use it (Go to my computer, Control Panel, Power Options, Turn off monitor after...and select the time period necessary)

5. Multiple people should be able to access the drive and its contents at the same time without disruption.

Data Structure Layout								
Bold indicates folder, Normal indicates file								
	A	B	C	D	E	F	G	H
1	GIS							
2		2010 Appendix C	Databases	AOP Barrier Inventory.accdb				
3				Field Notes Database.accdb				
4				Generic AOP Assessment Sheet.doc				
5				statewide_aquatic_irreplace.dbf				
6			Guidesheets	Appendix C Binder.pdf				
7				Data Structure Layout and Index.xlsx				
8				GS1 GIS WS Characterization.pdf				
9				GS2 Watershed Landuse.pdf				
10				GS3 Human Threat Index Data.pdf				
11				GS4 Windshield Tour Map.pdf				
12				GS5 Field Notes DB Entry.pdf				
13				GS6 Displaying Aquatic Records.pdf				
14				GS7 Generic AOP Inventory.pdf				
15				GS8 Calculating Predicted, Targeted Species and HIS.pdf				
16				GS9 Locating Irreplaceability Values.pdf				
17				Instructions for Mapping to a Drive.pdf				
18				Water Quality and Biological Database Links.pdf				
19			Appendix C Watershed Characterization Intro Final.pdf					
20	Aerial Data	DOQ 1995	by city	by DOQ.sid				
21		NAIP04	by county.sid					
22		NAIP05	by county.sid					
23		NAIP06	by county.sid					
24		NAIP07	by county.sid					
25		NAIP08	by county.sid					
26		NAIP09	by county.sid					
27		Leaf Off 07-08	by DOQ.sid					
28	Aquatic GAP	Aquatic Data	Administrative	24k Topo Bounds.shp				
29				Cities.shp				
30				Counties.shp				
31				Highways.shp				
32				mdc_lands.shp				
33				MDC_regions.shp				
34				MO_State_border.shp				
35				publands_06.shp				
36				TRS_boundaries.shp				
37				VST_Owner_Steward	VST_own_steward.dbf			
38			ArcGIS 9.0 Projects	AquaticGapProject.mxd				
39				Aquatic GAPProjectBackup.mxd				
40			Biological	Collection_Data	Actual_BioData	MORAP_1900_99_fmcs_data.mdb		
41						RAM Fish.dbf		
42						RAM INVE.dbf		
43						RAM PHYS.dbf		
44						STATEWIDE.dbf		
45						Heritage	aquahert.shp	
46							herpt306.dbf	
47					GIS_biocollection_baselayers	All_sampled_segs.shp		
48						Lniangua_VST.shp		

Data Structure Layout								
Bold indicates folder, Normal indicates file								
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49							MORAP1900_99_sampled_segs.shp	
50							RAM1994_2005_sample_Locs.shp	
51							RAM _Sampled_segs.shp	
52					LandCover	MoRAP_LULC_05.lyr		
53						info		
54						morap_lulc_05		
55						nlcd_2001		
56						VST_Local_watshed_lulc	vst_lulc9293_inlet_watshed.dbf	
57							vst_lulc9293_local.dbf	
58							vst_lulc9293_outlet_watshed.dbf	
59					Modeled_Data	Habitat Affinities	MO_Crayfish_Habitat_Affinities.pdf	
60							MO_Fish_Habitat_Affinities_A_F.pdf	
61							MO_Fish_Habitat_Affinities_G_R.pdf	
62							MO_Fish_Habitat_Affinities_S_Z.pdf	
63							MO_Mussels_Habitat_Affinities.pdf	
64						Species_Counts	AESCNTM.accdb	
65						Species_Lists	LRCHAM.dbf	
66							LRCHEM.dbf	
67							LRCHSM.dbf	
68							LRCHSM_LNiangua.dbf	
69				Conservation_Priorities	All_priorities_combine.shp			
70					MDC_COAs	mdc_aquatic_coa.shp		
71						mdc_terr_coa.shp		
72						COAs Profiled	COAsProfiledPoly.shp	
73						Partner_COAs	Audobon	audobon_final_priorities.shp
74								IBA.pdf
75							Grassland_Coalition	GC_important_grassland.shp
76							N_AM_Bird_CI	nabci_OZ_sites.shp
77							TNC_Portfolios	tnc_aquatic_priorities.shp
78								tnc_terrestrial_priorities.shp
79							USFS	usfs_eco_mgtt_areas.shp
80				Ecological_Classification	Aquatic_ECS	MO_AES.lyr		
81						MO_AES.shp		
82						MO_Aq_Sub.s.shp		
83						MO_EDU.shp		
84						MO_VST.shp		
85						Segmentsheds	north_mo_segsheds.shp	
86							south_mo_segsheds.shp	
87					Terrestrial_ECS	MO_LTA.shp		
88						mo_sections		
89				info				
90				Physical	info			
91					Land	contours.shp		
92						generalized_geology.shp		
93						geoglogy.shp		
94						mostatsgo_dom_surftext_hydgrp.shp		
95						relief.lyr		
96						info		

Data Structure Layout								
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99							vst_phy_outlet_watshed.dbf	
100							vst_phy_segshed_local.dbf	
101					Water	coldwater_streams.shp		
102						loosing_streams.shp		
103						major_waterbodies.shp		
104						majriver.shp		
105						springs.shp		
106						wetland_complexes.shp		
107			Attribute_Descriptions	Field Definitions Richness Count Files.pdf				
108				Field Definitions Richness List Files.pdf				
109				General_description_Aquatic_ECS.pdf				
110				HSI_methods_description.pdf				
111				MO_AES_attribute_descriptions.pdf				
112				MO_Aq_Subregions_attribute_descriptions.pdf				
113				MO_Aquatic_GAP_Report.pdf				
114				MO_EDU_attribute_descriptions.pdf				
115				MO_Segmentshed_attribute_descriptions.pdf				
116				MO_streams_metadata.pdf				
117				MO_VST_attribute_descriptions.pdf				
118				VST_Human_Stressor_Source_Data.pdf				
119			CWCSCOA project	AqECSDescriptions	AESs (word docs)			
120					EDUs (word docs)			
121					Introduction.doc			
122					Principle Information Sources.doc			
123				COAs Profiled	COA Profiles (pdf's of each)			
124					project initiative descriptions (pdfs)			
125				ECS Descriptions (word docs)				
126				info				
127				LTA Types	ecslta.shp			
128					(word docs)			
129			Human Disturbance	AES_Stressor_Data	aes_core_hsi_stressors.dbf			
130					AES_HSI_Metrics_Index.dbf			
131				Raw_Stressor_Data	303dstreams1.shp			
132					active_oil_gas_wells.shp			
133					agnps.shp			
134					Airports.shp			
135					cafo_animal.shp			
136					cafo_faccis.shp			
137					Coal_Mines.shp			
138					Dams.shp			
139					Hazardwaste.shp			
140					hswastes.shp			
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142					Instream_Mines.shp			
143					landfills.shp			
144					Lead_Mines.shp			

Data Structure Layout								
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147					Major_Impoundments.shp			
148					Military_Sites.shp			
149					mines.shp			
150					MO_Cert_Wells.shp			
151					MO_LUST.shp			
152					MO_NPDES_CAFO's.shp			
153					MO_UST.shp			
154					NPDES.shp			
155					pcs3.shp			
156					population_centers.shp			
157					Power_lines.shp			
158					railroads.shp			
159					Raw_Stressor_Source_Data.docx			
160					RCRIS_noTri.shp			
161					Road_Stream_Crossings.shp			
162					Roads.shp			
163					Superfund.shp			
164					TRI.shp			
165					Waste_Water_Treatment.shp			
166					Water_transfer_stations.shp			
167					impervious01			
168					info			
169					Neighboring_States	IA_Cert_Wells.shp		
170						IA_LUST.shp		
171						IA_UST.shp		
172						KS_Cert_Wells.shp		
173						KS_LUST.shp		
174						KS_UST.shp		
175						NE_Cert_Wells.shp		
176						NE_LUST.shp		
177				VST_Stressor_Data	vst_stressors_inlet_watshed.dbf			
178					vst_stressors_local.dbf			
179					vst_stressors_outlet_watshed.dbf			
180			LittleNiangua	Little_Niangua_COA.shp				
181				Little_Niangua_VST.shp				
182				speciesbyseg.dbf				
183				speciesxseg_sum.dbf				
184				Sum_Output.dbfs (0-11)				
185			Pflieder_Regional_Data	pfl faunal.bmp				
186				Pflieder Faunal Regions.shp				
187			AppendixA_MDC_AQtraining_Manual.doc					
188			AppendixA_MDC_Aquatic_DSS_Data_Structure.xlsx					
189			MDC_Aquatic_Training_Manual22908final.doc					
190		Historic Land Cover	info					
191			landcov					
192		Impaired Waters	Lakes_303(d)_2006	IMPRD_2006_L.shp				

Data Structure Layout								
Bold indicates folder, Normal indicates file								
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194			Streams_303(d)_2006	IMPRD_2006_S.shp				
195			Streams_305(b)_2008	st_qltrpt_2008_S	QLTRPT_2008_S.shp			
196	Mining		IMOP.shp					
197	MORAP HTD		Administrative	CITIES.shp				
198				COUNTIES.shp				
199				Roads.shp				
200				STATES.shp				
201			Base_Data	info				
202				Stream_Network.gdb				
203				mo_catchments.shp				
204				mo_riparian_buffers.shp				
205				mo_vst1.shp				
206			Missouri_Specific_Data	MO_CAFOs.shp				
207				MO_Haz_Generator.shp				
208				MO_Haz_Waste_Permits.shp				
209				MO_NPDES.shp				
210				MO_specific_threats.dbf				
211				MO_UST.shp				
212			Natural_Tables	landcover.dbf				
213				riparian_landcover.dbf				
214				soil_hydro_group.dbf				
215				soil_rock_depth.dbf				
216				soil_rock_frag.dbf				
217				soil_texture.dbf				
218			NLCD	info				
219				nlcd_2001				
220			Relief	info				
221			Threat_Data_1	1990_Population.gdb				
222				2000_Population.gdb				
223				certified_wells	IA_wells.shp			
224					KS_wells.shp			
225					MO_wells.shp			
226					NE_wells.shp			
227				impervious				
228				info				
229				Airports.shp				
230				CAFOs.shp				
231				Coal_Mines.shp				
232				Dams.shp				
233				EPA_R7_channelized_streams_v1.shp				
234				EPA_R7_headwater_impoundments_v1.shp				
235				Landfills.shp				
236				Lead_Mines.shp				
237				LUST_shp				
238				Major_impoundments.shp				
239				Military_Bases.shp				
240				Mines.shp				

Data Structure Layout								
Bold indicates folder, Normal indicates file								
	A	B	C	D	E	F	G	H
241				NPDES.shp				
242				Oil_Gas_Wells.shp				
243				Rail_Stream_Crossings.shp				
244				Railroads.shp				
245				RCRIS.shp				
246				Road_Stream_Crossings.shp				
247				Superfund.shp				
248				Toxic_Releases.shp				
249				WWTF.shp				
250			Threat_Data_2	crop_pest_v1				
251				info				
252			Threat_Tables	distances_to_threats.dbf				
253				fragmentation.dbf				
254				human_threat_attributes.dbf				
255	Statewide Server Data		Aquatic COA	mdc_aquatic_coa.shp				
256			County	Statewide Counties	county_a_soil.shp			
257					county_d_soil.mbb			
258					county_p_soil.dbf			
259					roads.shp			
260					SCANMAP.TIF			
261			DOQ	by city	by orthophotoquad.sid			
262			Region	Contour24k	by city	by orthophotoquad.shp		
263				Fisheries	Trout	busch_winter_areas.shp		
264						Class1_Pools.shp		
265						Class1_Riffles.shp		
266						Class_2_Pools.shp		
267						Class_2_Riffles.shp		
268						Class_3_Pools.shp		
269						Class_3_Riffles.shp		
270						columbia_winter_areas.shp		
271						designated_trout_areas.shp		
272						Final_State_Layers.mxd		
273						Final_State_Layers_co_rsc.mxd		
274						jackson_winter_areas.shp		
275						jeffcity_winter_areas.shp		
276						kc_winter_areas.shp		
277						State_Pools.shp		
278						State_Riffles.shp		
279						stlouis_winter_areas.shp		
280				Forestry				
281				Heritage	eorform.mdb			
282					erallpt.shp			
283					erpoly.shp			
284					erpt.shp			
285					erstmts.shp			
286					GISfactsheet.doc			
287					herallpt.shp			
288					hertpoly.shp			

Data Structure Layout								
Bold indicates folder, Normal indicates file								
	A	B	C	D	E	F	G	H
289					reduced_attributes_evalpt.shp			
290					short dictionary.doc			
291				Landcov	info			
292					lulc05			
293					nlcdmo			
294					lulc05.lyr			
295					nlcdmo.lyr			
296					LULC_05.doc			
297					LULCtbl.DBF			
298					nlcd_FGDCmetadata.doc			
299					nlcdmo_readme.doc			
300				NWI	DIGIT4.shp			
301					DIGIT8.shp			
302					MAPCODE.TXT			
303					MDC_Wetlands.lyr			
304					MDC_Wetlands.shp			
305					NWI_META.txt			
306					NWIL.dbf			
307					NWIP.dbf			
308					NWI_RDME.txt			
309					README.TXT			
310					0710	desminwil.shp		
311						desminwip.shp		
312					0711	bobnwil.shp		
313						bobnwip.shp		
314						cuivnwil.shp		
315						cuivnwip.shp		
316						lsalnwil.shp		
317						lsalnwip.shp		
318						msalnwil.shp		
319						msalnwip.shp		
320						nfabnwil.shp		
321						nfabnwip.shp		
322						nrthnwil.shp		
323						nrthnwip.shp		
324						nsalnwil.shp		
325						nsalnwip.shp		
326						perdnwil.shp		
327						perdnwip.shp		
328								
329						sfabnwil.shp		
330						sfabnwip.shp		
331						wfoxnwil.shp		
332						wfoxnwip.shp		
333					0714	bigpnwil.shp		
334						bigpnwip.shp		
335						bigrnwil.shp		
336						bigrnwip.shp		

Data Structure Layout								
Bold indicates folder, Normal indicates file								
	A	B	C	D	E	F	G	H
337						bournwil.shp		
338						bournwip.shp		
339						castnwil.shp		
340						castnwip.shp		
341						mernwil.shp		
342						mernwip.shp		
343						mtrbnwil.shp		
344						mtrbnwip.shp		
345						mtrcnwil.shp		
346						mtrcnwip.shp		
347					0801	mbeInwil.shp		
348						mbeInwip.shp		
349					0802	cachnwil.shp		
350						cachnwip.shp		
351						litbnwil.shp		
352						litbnwip.shp		
353						lstfnwil.shp		
354						lstfnwip.shp		
355						stjbnwil.shp		
356						stjbnwip.shp		
357						ustfnwil.shp		
358						ustfnwip.shp		
359					1024	litInwil.shp		
360						litInwip.shp		
361						moupnwil.shp		
362						moupnwip.shp		
363						nodanwil.shp		
364						nodanwip.shp		
365						platinwil.shp		
366						platinwip.shp		
367						tarknwil.shp		
368						tarknwip.shp		
369					1027	mokgnwil.shp		
370						mokgnwip.shp		
371					1028	khanwil.shp		
372						khanwip.shp		
373						mgranwil.shp		
374						mgranwip.shp		
375						thomnwil.shp		
376						thomnwip.shp		
377						ugranwil.shp		
378						ugranwip.shp		
379						upchnwil.shp		
380						upchnwip.shp		
381					1029	bgpnwil.shp		
382						bgpnwip.shp		
383						lakenwil.shp		
384						lakenwip.shp		

Data Structure Layout								
Bold indicates folder, Normal indicates file								
	A	B	C	D	E	F	G	H
385						gasnwil.shp		
386						gasnwip.shp		
387						lgasnwil.shp		
388						lgasnwip.shp		
389						lchanwil.shp		
390						lchanwip.shp		
391						lichnwil.shp		
392						lichnwip.shp		
393						liosnwil.shp		
394						liosnwip.shp		
395						loosnwil.shp		
396						loosnwip.shp		
397						mardnwil.shp		
398						mardnwip.shp		
399						marmnwil.shp		
400						marmnwip.shp		
401						nianwil.shp		
402						nianwip.shp		
403						pomnwil.shp		
404						pomnwip.shp		
405						sacnwil.shp		
406						sacnwip.shp		
407						sgranwil.shp		
408						sgranwip.shp		
409						ugasnwil.shp		
410						ugasnwip.shp		
411						uposnwil.shp		
412						uposnwip.shp		
413					1030	bwatnwil.shp		
414						bwatnwip.shp		
415						lamnwil.shp		
416						lamnwip.shp		
417						moghnwil.shp		
418						moghnwip.shp		
419						mohsnwil.shp		
420						mohsnwip.shp		
421					1101	blcknwil.shp		
422						blcknwip.shp		
423						curnwil.shp		
424						curnwip.shp		
425						elevnwil.shp		
426						elevnwip.shp		
427						fournwil.shp		
428						fournwip.shp		
429						jamenwil.shp		
430						jamenwip.shp		
431						nfrknwil.shp		
432						nfrknwip.shp		

Data Structure Layout								
Bold indicates folder, Normal indicates file								
	A	B	C	D	E	F	G	H
433						sprwnwil.shp		
434						sprwnwip.shp		
435						tlaknwil.shp		
436						tlaknwip.shp		
437						whitnwil.shp		
438						whitnwip.shp		
439					1107	chernwil.shp		
440						chernwip.shp		
441						elknwil.shp		
442						elknwip.shp		
443						sprnwil.shp		
444						sprnwip.shp		
445				PUBLAND	coe.shp			
446					Corps_Mitigation.shp			
447					dnr.shp			
448					KatyTrail.shp			
449					moagrd.shp			
450					MPF.shp			
451					nps.shp			
452					OzarkTrail.shp			
453					PioneerForest.shp			
454					tnc.shp			
455					usfs.shp			
456					usfs_RangerDistricts.shp			
457					usfws.shp			
458				Resource Science	MDC_Data_to_2006.shp			
459				Stream24	(24000 Stream Files by Number)			
460				Wildlife	Focus Areas	Cave_FA.shp		
461						Grassland_FA.shp		
462						Prarie_Chk_FA.shp		
463						Quail_FA.shp		
464				airports.shp				
465				allhwy.shp				
466				blockgrp.shp				
467				contours.shp				
468				ecslta.shp				
469				ecssect.shp				
470				ecssub.shp				
471				geolbed.shp				
472				geolsurf.shp				
473				preprair.shp				
474				railroads.shp				
475				rivers.shp				
476				schoolist.shp				
477				sections.shp				
478				towers.shp				
479				villages.shp				
480				votedist.shp				

Data Structure Layout
Bold indicates folder, Normal indicates file

	A	B	C	D	E	F	G	H
481				watrbody.shp				
482				wtrshd11.shp				
483				wtrshd12.shp				
484			State	Cities.shp				
485				County.shp				
486				Deelines.shp				
487				Districts.shp				
488				Majhwy.shp				
489				Majlake.shp				
490				Majriver.shp				
491				MDCland.shp				
492				Natdiv.shp				
493				Offices.shp				
494				regions.shp				
495				TopoBoundaries.shp				
496				units.shp				
497				Wtrp_a_mo.shp				
498				Zipcodes.shp				
499				MDCBASIN	BND.DBF			
500					PAT.DBF			
501					TIC.DBF			
502				WTRSHEDS	AAT.DBF			
503					BND.DBF			
504					PAT.DBF			
505					theme2.shp			
506					TIC.DBF			
507			TOPO	By City	(by orthophotquad.TIF)			
508					DRGcatv9.dbf			
509		Stream Team Monitoring Sites	STRM_TM_VWQM.dbf					
510			STRM_TM_VWQM.shp					
511								
512								
513								
514								
515								
516								
517								
518								

Data Name	Column and Row	Data Description
0710	E310	Folder containing HUC4 Des Moines River Basins NWI data
0711	E312	Folder containing HUC4 Upper Mississippi and Salt River Basins NWI data
0714	E333	Folder containing HUC4 Missouri-Upper Kaskaskia-Meramec River Basins NWI data
0801	E347	Folder containing HUC4 Lower Mississippi -Hatchie River Basins NWI data
0802	E349	Folder containing HUC4 Lower Mississippi -St. Francis River Basins NWI data
1024	E359	Folder containing HUC4 Missouri-Nishnabotna River Basins NWI data
1027	E369	Folder containing HUC4 Kansas River Basin NWI data
1028	E371	Folder containing HUC4 Chariton- Grand-Little Chariton River Basins NWI data
1029	E381	Folder containing HUC4 Gasconade-Osage River Basins NWI data
1030	E413	Folder containing HUC4 Missouri River Basin NWI data
1101	E421	Folder containing HUC4 White River Basin NWI data
1107	E439	Folder containing HUC4 Neosho-Verdigris River Basins NWI data
1990_Population.gdb	D221	1990 Census Blocks for Iowa, Kansas, Missouri and Nebraska
2000_Population.gdb	D222	2000 Census Blocks for Iown, Kansas, Missouri and Nebraska
2010 Appendix C	B2	Folder containing Guidesheet instructions and databases
24k Topo Bounds.shp	E28	Shapefile of 1:24,000 topographic map boundaries
303dstreams1.shp	E131	Impaired streams of Missouri
AAT.DBF	E502	Database for MDC basins
active_oil_gas_wells.shp	E132	Shapefile of wells that are actively producing oil or gas in Missouri
Actual_BioData	F40	Subfolder containing Mo_RAP, RAM, and Heritage Data
Administrative	C197	Folder containing geopolitical polygon and line shapefiles
Aerial Data	B20	.SID files of aerial data for the state of Missouri for 1995, 2004, 2005, 2006, 2007, 2008, 2009
aes_core_hsi_stressors.dbf	E129	DBF table with the raw stressor data for each AES polygon that was used in developing the HIS
AES_HSI_Metrics_Index.dbf	E130	DBF table with the individual stressor metrics and the overall HIS for each AES polygon
AES_Stressor_Data	D129	Subfolder containing the Human Sterssor Index developed by MoRAP and associated data
AESCNTM.accdb	G64	Aquatic Gap Species Count Table Database
AESs (word docs)	E119	Aquatic Ecological Systems folder with word documents
agnps.shp	E133	Agricultural Non-Point Source Pollution Model shapefile
Airports.shp	E134	Shapefile Airports in Missouri
All_priorities_combine.shp	E69	Shapefile of all priority locations included above
All_sampled_segs.shp	G47	Shapefile of all Missouri Stream sampled segments
allhwy.shp	D465	Shapefile of all Missouri Highways
AOP Barrier Inventory.accdb	D2	Database containing information on AOP Barrier inventory
AppendixA_MDC_Aquatic_DSS_Data_Structure.xlsx	C188	Data Structure and Folder/File Descriptions for the Aquatic DSS
Appendix C Binder.pdf	D6	All Guidesheets in one pdf
Appendix C Watershed Characterization Intro Final.pdf	C19	Introduction to Appendix C (Watershed Characterization)
aquahert.shp	H45	Shapefile of <u>aquatic</u> heritage records for MO
Aquatic COA	C255	Folder containing Missouri aquatic COA data
Aquatic Data	C28	Parent folder containing all of the Aquatic Data in the Aquatic GAP folder
Aquatic GAP	B28	Parent folder containing all Aquatic Gap Data
Aquatic GAPProjectBackup.mxd	E39	ArcGIS Project Developed for Training Session Backup
Aquatic_ECS	E80	Folder with written description of Aquatic Ecological Classification Units
AquaticGapProject.mxd	E38	ArcGIS Project Developed for Training Session
ArcGIS 9.0 Projects	D38	ArcGIS Project Developed for Training Session
Attribute_Descriptions	C107	Folder containing metadata and written for various shapefiles and DBFs
audobon_final_priorities.shp	H73	Missouri Final Priorities Audobon shapefile
Audobon	G73	Shapefile of the audobon important bird areas
Base_Data	C201	Folder containing Stream_Network.gdb, mo_catchments, mo_riparian_buffers, mo_vst1
bigprnwil.shp	F333	NWI Big Piney River Basin line data
bigprnwip.shp	F334	NWI Big Piney River Basin polygon data
blcknwil.shp	F421	NWI Black River Basin line data
blcknwip.shp	F422	NWI Black River Basin polygon data
bigrnwil.shp	F335	NWI Big River Basin Line Data
bigrnwip.shp	F336	NWI Big River Basin Polygon Data
Biological	D40	A folder containing biological shapefiles and DBF tables
blockgrp.shp	D466	Census Blockgorup from 2000 Census
BND.DBF	E499	Database for MDC basins
bobnwip.shp	F313	NWI North River- Bob's Creek Basin line data
bobnwil.shp	F312	Nwl North River- Bob's Creek Basin polygon data
bournwil.shp	F337	NWI Bourbeuse River Basin Line Data
bournwip.shp	F338	NWI Bourbeuse River Basin Polygon Data
busch_winter_areas.shp	F263	Shapefile of Busch conservation areas pertaining to trout programs
bwatnwil.shp	F413	NWI Black Water River Basin line data
bwatnwip.shp	F414	NWI Black Water River Basin polygon data
By City	D507	Folder containing TOPO maps listed by city.
by county.sid	D21,D22,D23,D24,D25,D26	Aerial Data listed by county (2004, 2005, 2006, 2007, 2008, 2009)
by DOQ.sid	D27	2008 Aerial Data listed by city
by orthophotoquad.shp	F262	DOQ listed by orthophotoquad (by city)

Data Index and Metadata

by orthophotoquad.sid	E261	.sid listed by orthophotoquad
cachnwil.shp	F349	NWI Cache River Basin line data
cachnwip.shp	F350	NWI Cache River Basin polygon data
cafo_animal.shp	E135	Confined animal feed operation shapefile
cafo_faccls.shp	E136	Confined animal feed operation shapefile containing site and operator/owner information
CAFOs.shp	D230	Confined animal feed operation shapefile
castnwil.shp	F339	NWI Castor-White Water Rivers Basin Line Data
castnwip.shp	F340	NWI Castor-White Water Rivers Basin Polygon Data
Cave_FA.shp	F460	Representation of areas that delineate cave / karst features of potential or existing high biodiversity
certified_wells	D223	Folder of wells certified by MO, IA, KS, and NE
chernwil.shp	F439	NWI Cherokee Lake Basin line data
chernwip.shp	F440	NWI Cherokee Lake Basin polygon data
CITIES.shp	D197	Shapefile of major cities in Missouri
Class_2_Pools.shp	F266	Class 2 Pools assessed values of low velocity resting areas / feeding stations, obscurity, and depth or diversity of depth
Class_2_Riffles.shp	F267	Class 2 Riffles assessed values of low velocity resting areas / feeding stations, obscurity, and depth or diversity of depth
Class_3_Pools.shp	F268	Class 3 Pools assessed values of low velocity resting areas / feeding stations, obscurity, and depth or diversity of depth
Class_3_Riffles.shp	F269	Class 3 Riffles assessed values of low velocity resting areas / feeding stations, obscurity, and depth or diversity of depth
Class1_Pools.shp	F264	Class 1 Pools assessed values of low velocity resting areas / feeding stations, obscurity, and depth or diversity of depth
Class1_Riffles.shp	F265	Class 1 Riffles assessed values of low velocity resting areas / feeding stations, obscurity, and depth or diversity of depth
COA Profiles (pdf's of each)	E123	.pdf containing descriptions of the COA profiles
Coal_Mines.shp	E137	Shapefile of Coal Mines in Missouri
COAs Profiled	F72	Subfolder containing shapefile of the 32 Priority COAs for Missouri
COAsProfiledPoly.shp	G72	Shapefile of the 32 priority COAs that have written profiles
coe.shp	E445	Army Corp. of Engineers land shapefile
coldwater_streams.shp	F101	Shapefile of coldwater streams in Missouri (not complete)
Collection_Data	E40	Subfolder with MoRAP and RAM Species Collection Data and associated shapefiles and Missouri Heritage Data shapefiles
columbia_winter_areas.shp	F270	Point-Feature shapefile of MDC land in columbia (contains area and directions)
Conservation_Priorities	D69	Subfolder containing shapefiles of MDC and Partner Priority Areas in Missouri
Contour24k	D262	Folder containing point-feature shapefiles, listed by cities, representing elevation data
contours.shp	D467,F91	Shapefile of topgraphic contour lines of Missouri
Corps_Mitigation.shp	E446	Contains information on acreage calculations, time comparision for improvement on mitigation sites for Corp. of Engineers mitigation sites
COUNTIES.shp	D198	Shapefile of Missouri county boundaries
County	C256	General folder containing statewide data listed by county (soils, roads, streams, etc.)
County.shp	D485	Shapefile of county boundaries in the state of Missouri
county_a_soil.shp	E256	Shapefile of soil data (like type and area respresentation)
county_d_soil.mbb	E257	Geodatabase of specific county soil information
county_p_soil.dbf	E258	Point-feature shapefile of county soils listing MUSYM
crop_pest_v1	D250	Consists of estimated agricultural crop pesticide use based on an integratioin of the Natl. land Cover Dataset and US Agr. Census Data
cuivnwil.shp	F314	NWI CuivreRiver Basin line data
cuivnwip.shp	F315	NWI CuivreRiver Basin polygon data
curnwil.shp	F423	NWI Current River Basin line data
curnwip.shp	F424	NWI Current River Basin polygon data
CWCSCOA project	C119	Folder containing a series of written descriptions that are hotlinked to the associated shapefiles
Dams.shp	E138,D232	Shapefile of Dams in Missouri
Databases	C2	Folder containing aquatic and field notes database files
Data Structure Layout and Index.xlsx	D7	Data routes and location as well as an index with a description of the data
desminwil.shp	F310	NWI Des Moines River Basin line data
desminwip.shp	F311	NWI Des Moines River Basin polygon data
DIGIT4.shp	E300	Shapefile of HUC4 MO Basins
DIGIT8.shp	E301	Shapefile of HUC 8 MO Basins
distances_to_threats.dbf	D252	Database table that contains information regarding minimum, maximum and mean distances to upstream threats for each stream segment
Districts.shp	D487	Shapefile that displays the administrative boundaries for the Missouri Department of Conservation's Diestricst Coordination Teams
dnr.shp	E447	Shapefile that depicts the boundaries of parks and historic sites managed by the MO Dept. of Natural Resources, Division of State Parks
DOQ	C261	Folder containing Digital Orthophoto Quadrangle images listed by city
DOQ 1995	C20	Digital Orthophotoquads from 1995 folder
Ecological_Classification	D80	Subfolder containing shapefiles of Aquatic and Terrestrial Ecological Classification Units
ECS Descriptions (word docs)	D125	Folder containing ecological classification system data for distinct riverine ecosystem site data (location, boundaries, general description)
ecsIta.shp	E127,D468	Shapefile of Missouri land-type associations (i.e. Alluvial Plains, Prarie Plains, Oak-Pine Hills, etc.)
ecssect.shp	D469	Shapefile of Four ECS sections in Missouri (Central Dissected Till Plains, MS River Alluvial Basin, Osage Plains, and Ozark Highlands)
ecssub.shp	D470	Shaplefile of the subsuctions of the ecssect.shp
EDUs (word docs)	E120	Ecological Drainage Unit word documents folder
elknwil.shp	F441	NWI Elk River Basin line data
elknwip.shp	F442	NWI Elk River Basin polygon data
elevnwil.shp	F425	NWI Eleven Point River Basin line data
elevnwip.shp	F426	NWI Eleven Point River Basin polygon data
eorform.mdb	E281	Geodatabase of site specific vegetation data
EPA_R7_channelized_streams_v1.shp	D233	Shapefile of all ditches or channelized pieces of stream that could be identified using Natl. Hydrography Dataset (NHD), Natl. Wetlands Inventory, and a modified version of NHD
EPA_R7_headwater_impoundments_v1.shp	D234	Shapefile of all headwater impoundments that could be identified the elevation derivatives for Natl. Applications, Natl. Land Cover Database (NHD), Natl. Wetlands Inventory, NHD (modified)
erallpt.shp	E282	Ecological Classifican System point shapefile in Missouri specifying vegetation information

Data Index and Metadata

erpoly.shp	E283	Ecological Classifican System polygon shapefile in Missouri specifying vegetation information
erpt.shp	E284	Point Shapefile of specific vegetation sites in Missouri classified by ecological names
erstmts.shp	E285	Shapefile of ecological region specified through animal or fish domain (bald eagle, spawning, karst, Grassland Focus Area, Ozark Hellbender, etc.)
Field Definitions Richness Count Files.pdf	D107	Metadata for DBFs contained in the Species_Counts subfolder
Field Definitions Richness List Files.pdf	D108	Metadata for DBFs contained in the Species_Lists subfolder
Field Notes Database.accdb	D3	Database and Entry form for road/stream crossing information
Final_State_Layers_co_rsc.mxd	F273	.mxd file with State Pools and State riffles as well as Class 1 through 3 Pools and Riffles
Fisheries	D263	Sub-folder of the Statewide Server Data folder that contains Trout and Class 1,2, and 3 pool and riffle data
Focus Areas	E460	Wildlife subfolder containing Cave_FA, Grassland_FA, Prarie_Chk_FA, and Quail_FA shapefiles
Forestry	D280	Statewide Server Data forestry subfolder
fournwil.shp	F427	NWI Fourche Creek Basin line data
fournwip.shp	F428	NWI Fourche Creek Basin polygon data
fragmentation.dbf	D253	DBF of stream fragmentation/connectivity for each stream segment based on major impoundments
GC_important_grassland.shp	H75	Important Grasslands .shp i
Generic AOP Assessment Sheet.doc	D4	AOP Inventory and Assessment Sheet
generalized_geology.shp	F92	Shapefile of generalized geologic categories for Missouri
geology.shp	F93	Shapefile of Missouri geology
geolbed.shp	D471	Digitized version of Missouri's geological bed
GIS_biocollection_baselayers	F47	Shapefiles to which the DBFs of MoRAP and RAM collection data join or link to
GISfactsheet.doc	E286	Shapefile of known locations and associated information on Species and Natural Communities of Conservation Concern
Grassland_Coalition	G75	Subfolder of Aquatic Data>MDC COAs that contains the GC_Important_Grassland.shp file
Grassland_FA.shp	F461	Shapefile of Grassland Coalition important grasslands
GS1 GIS WS Characterization.pdf	D8	Instructions for delineating a watershed
GS2 Watershed Landuse.pdf	D9	Instructions for quantifying land-use and land-cover within a delineated watershed
GS3 Human Threat Index Data.pdf	D10	Instructions for displaying the human threats located within a delineated watershed
GS4 Windshield Tour Map.pdf	D11	Instructions for locating road and stream crossings
GS5 Field Notes DB Entry.pdf	D12	Instructions for entering data into the field notes database as well as exporting the database into ArcMap
GS6 Displaying Aquatic Records.pdf	D13	Instructions for displaying aquatic records using ArcMap software
GS7 Generic AOP Inventory.pdf	D14	Inventory sheet and database to use as a template if conducting AOP inventories in the watershed
GS8 Calculating Predicted, Targeted Species and HIS.pdf	D15	Instructions on calculating total predicted, targeted species, and human stress index by AES
GS9 Locating Irreplaceability Values.pdf	D16	Instructions on locating irreplaceability values using ArcGIS software
Hazardwaste.shp	E139	Shapefile of hazardous waste in Missouri
herallpt.shp	E287	Shapefile of all heritage points in the state of Missouri
Heritage	D281	Subfolder containing shapefiles of the Missouri Heritage Database
hertpoly.shp	E288	Heritage polygons in the State of Missouri
hertpt306.dbf	H46	Shapefile of the heritage records for MO
Highways.shp	E31	Shapefile of Missouri Highways
Historic Land Cover	B190	Folder with Historic Land Cover data
HSI_methods_description.pdf	D110	Overview of the Methods used to create the Human Stress Index
hswastes.shp	E140	Waste Facilities in the State of Missouri
Human Disturbance	C129	Subfolder containing data and shapefiles pertaining to Human Stressors
human_threat_attributes.dbf	D254	Database of human threat attributes
IA_Cert_Wells.shp	F169	Shapefile of IA certified wells
IA_LUST.shp	F170	Shapefile of leaking underground storage tanks in IA
IA_UST.shp	F171	Shapefile of Iowa underground storage tanks
IA_wells.shp	E223	Shapefile of Iowa wells
IBA.pdf	H74	.pdf displaying a map of the Important Bird Areas in Missouri
ifd.shp	E141	Shapefile of MoRAP Facility Discharge Sites
IMOP.shp	C196	Shapefile of Mining Operations in the State of Missouri
Impaired Waters	B192	Folder containing MODNR's impaired water shapefiles
impervious	D227	All impervious surfaces in the State of Missouri developed using Land-Use, Land-Cover data
impervious01	E167	Subfolder containing files that make up an impervious surface grid for Missouri
IMPRD_2006_L.shp	D192	Shapefile of lakes listed on DNR/EPA's 303(d) list
IMPRD_2006_S.shp	D194	Shapefile of streams listed on DNR/EPA's 303(d) list
Instream_Mines.shp	E142	Shapefile of instream mines located in Missouri
Introduction.doc	E121	Appendix 1 Introduction: General Overview of the Missouri Aquatic Ecological Classification System
Instructions for Mapping to a Drive.pdf	D17	Instructions on mapping external hard drives to the computer network
jackson_winter_areas.shp	F274	Point-Feature shapefile of MDC land in Jackson (contains area and directions)
jamenwil.shp	F429	NWI James River Basin line data
jamenwip.shp	F430	NWI James River Basin polygon data
jeffcity_winter_areas.shp	F475	Point-Feature shapefile of MDC land in Jefferson City (contains area and directions)
KatyTrail.shp	E448	Shapefile of the Katy Trail
kc_winter_areas.shp	F276	Point-Feature shapefile of MDC land in Kansas City (contains area and directions)
KS_Cert_Wells.shp	F172	Shapefile of Kansas certified wells
KS_LUST.shp	F173	Shapefile of Kansas (leaking) underground storage tanks
KS_UST.shp	F174	Shapefile of Kansas underground storage tanks
KS_wells.shp	E224	Shapefile of Kansas wells
lakenwil.shp	F383	NWI Lake Ozarks Basin line data
lakenwip.shp	F384	NWI Lake Ozarks Basin polygon data

Lakes_303(d)_2006	C192	Folder containing the lakes listed on Missouri's 2006 303(d) list
Lakes_305(b)_2008	C193	Folder containing the lakes listed on Missouri's 2008 305(b) list
lamnwil.shp	F415	NWI Lamine River Basin line data
lamnwip.shp	F416	NWI Lamine River Basin polygon data
Land	E91	Subfolder containing data and shapefiles pertaining to Missouri's land resources
Landcov	D291	Folder containing landcover (lulc05 & nlcdmo) data in the statewide server data
LandCover	E52	Folder in the Aquatic Gap containing landcover data
landcover.dbf	D212	Contains info about the amount of each landcover class quantified for the local catchment and upstream drainage area for each stream segment in the Mo_VST.shp shapefile
Landfills.shp	D235	Shapefile of landfills
Lead_Mines.shp	D236	Shapefile of lead mines located in Missouri
Leaf Off 07-08	C27	Folder with aerials of Leaf Off for 07-08 by DOQ
Levees_combined.shp	E145	Shapefile of levees and their coverage area
lgasnwil.shp	F387	NWI Lower Gasconade River Basin line basin
lgasnwip.shp	F388	NWI Lower Gasconade River Basin polygon basin
lchanwil.shp	F389	NWI Lower Chariton River Basin line data
lchanwip.shp	F390	NWI Lower Chariton River Basin polygon data
lichnwil.shp	F391	NWI Little Chariton River Basin line data
lichnwip.shp	F392	NWI Little Chariton River Basin polygon data
liosnwil.shp	F393	NWI Little Osage River Basin line data
liosnwip.shp	F394	NWI Little Osage River Basin polygon data
litbnwil.shp	F351	NWI Little River System (Bootheel) line data
litbnwip.shp	F352	NWI Little River System (Bootheel) polygon data
littnwil.shp	F359	NWI Little River System line data
littnwip.shp	F360	NWI Little River System polygon data
Little_Niangua_COA.shp	D180	Shapefile of Little Niangua Conservation Opportunity Area
Little_Niangua_VST.shp	D181	Valley Segment Type shapefile for Little Niangua
LittleNiangua	C180	Folder containing Little Niangua COA, VST, speciesbyseg.dbf, speciesxseg.dbf, and Sum_Output.dbfs(0-11)
Lnangua_VST.shp	G48	Little Niangua watershed stream line shapefile
loosing_streams.shp	F102	Shapefile of streams classified as "losing streams" in Missouri (not complete)
loosnwil.shp	F395	NWI Lower Osage River Basin line data
loosnwip.shp	F396	NWI Lower Osage River Basin polygon data
LRCHAM.dbf	G65	Aquatic Gap Species List Database
LRCHEM.dbf	G66	Aquatic Gap Species List Database
LRCHSM.dbf	G67	Aquatic Gap Species List Database
LRCHSM_LNiangua.dbf	G68	Aquatic Gap Species List Database pertaining to the Little Niangua watershed
lsalnwil.shp	F316	NWI Lower Salt River Basin line data
lsalnwip.shp	F317	NWI Lower Salt River Basin polygon data
lstfnwil.shp	F353	NWI Lower Saint Francis Basin line data
lstfnwip.shp	F354	NWI Lower Saint Francis Basin polygon data
LTA Types	D127	Folder containing the ecslta.shp shapefile and the ecsltacolors.lyr file
LULC_05.doc	E296	Land Use Land Cover 2005 word document
lulc05	E292	Folder with 2005 landcover data
lulc05.lyr	E294	2005 landcover data
LULCtbl.DBF	E297	Database of Land Use Land Cover including names of the Land-uses
lust.shp	E146,D237	Shapefile of Leaking Underground Storage Tanks
majrriver.shp	F104,D490	Shapefile of major rivers in Missouri
Majhwy.shp	D488	Shapefile of major highways in Missouri
Majlake.shp	D489	Shapefile of major lakes in Missouri
Major_Impoundments.shp	E147,D238	Shapefile of major impoundments in Missouri
major_waterbodies.shp	F103	Shapefile of major waterbodies in Missouri
MAPCODE.TXT	E302	Text file of wetland and deepwater habitat classification code information
mardnwil.shp	F397	NWI Maries Descygnes River Basin line data
mardnwip.shp	F398	NWI Maries Descygnes River Basin polygon data
marmnwil.shp	F399	NWI Marmaton River Basin line data
marmnwip.shp	F400	NWI Marmaton River Basin polygon data
mbelnwil.shp	F347	NWI Mississippi River Main Stem Below Ohio River line data
mbelnwip.shp	F348	NWI Mississippi River Main Stem Below Ohio River polygon data
mdc_aquatic_coa.shp	F70	Shapefile of MDC aquatic COAs
MDC_Aquatic_Training_Manual22908final.doc	C189	Training Manual for Aquatic GAP information
MDC_COAs	E70	Subfolder containing shapefiles of MDC Conservation Opportunity Areas
MDC_Data_to_2006.shp	E458	Shapefile of MDC contaminants, a collation of over 25 years of fish contaminant data from over 300 sites across MO
mdc_lands.shp	E32	Shapefile of MDC-owned lands
MDC_regions.shp	E33	Shapefile of MDC management regions
mdc_terr_coa.shp	F71	Shapefile of MDC terrestrial COAs
MDC_Wetlands.lyr	E303	Layer of MDC wetlands
MDC_Wetlands.shp	E304	Shapefile of MDC wetlands
MDCBASIN	D499	Primary MDC Basin folder containing BND, PND and TIC .dbf files
MDCland.shp	D491	Shapefile of MDC land
memwil.shp	F341	NWI Meramec River Basin line data

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mernwip.shp	F342	NWI Meramec River Basin polygon data
mgranwil.shp	F373	NWI Middle Grand River Basin line data
mgranwip.shp	F374	NWI Middle Grand River Basin polygon data
Military_Bases.shp	D239	Shapefile of military bases
Military_Sites.shp	E148	Shapefile of military sites
Mines.shp	E149,D240	Shapefile of mines located in Missouri
Mining	B196	Folder with mining data
Missouri_Specific_Data	C206	MORAP Folder with Missouri specific data
MO_AES.lyr	F80	Layer of Aquatic Ecological Systems
MO_AES.shp	F81	Shapefile of Aquatic Ecological System Types for MO
MO_AES_attribute_descriptions.pdf	D111	Metadata for Mo_AES.shp
MO_Aq_Subregions_attribute_descriptions.pdf	D112	Metadata for MO_Aq_Subs.shp
MO_Aq_Subs.shp	F82	Shapefile of Aquatic Subregions for MO
MO_Aquatic_GAP_Report.pdf	D113	PDF of MO Aquatic GAP report
MO_CAFOs.shp	D206	Shapefile of Confiled Animal Feed Operations in Missouri
mo_catchments.shp	D203	Shapefile of MO catchments
MO_Cert_Wells.shp	E150	Shapefile of certified wells
MO_Crayfish_Habitat_Affinities.pdf	G59	PDF of MO crayfish affinities
MO_EDU.shp	F83	Shapefile of Ecological Drainage Units for MO
MO_EDU_attribute_descriptions.pdf	D114	Metadata for Mo_EDU.shp
MO_Fish_Habitat_Affinities_A_F.pdf	G60	PDF of MO fish habitat afinities A-F
MO_Fish_Habitat_Affinities_G_R.pdf	G61	PDF of MO fish habitat afinities G-R
MO_Fish_Habitat_Affinities_S_Z.pdf	G62	PDF of MO fish habitat afinities S-Z
MO_Haz_Generator.shp	D207	Shapefile of hazardous waste generators
MO_Haz_Waste_Permits.shp	D208	Shapefile of hazardous waste permits
MO_LTA.shp	F87	Shapefile of Landtype Associations for Missouri
MO_LUST.shp	E151	Location of Leaking Underground Storage Tank sites in Missouri where cleanup activities are occuring
MO_Mussels_Habitat_Affinities.pdf	G63	PDF of MO mussle habitat affinities
MO_NPDES.shp	D209	Shapefile of outfall locations of wastewater facilities with Missouri NPDES Operating Permits
MO_NPDES_CAFO's.shp	E152	Shapefile of outfall locations of CAFO wastewater facilities with Missouri NPDES Operating Permits
mo_riparian_buffers.shp	D204	Shapefile of riparian buffers for every primary channel stream segment in our study area (streams draining into MO)
mo_sections	F88	Shapefile of Ecological Sections for Missouri
MO_Segmentshed_attribute_descriptions.pdf	D115	Metadata for north and south_mo_segsheds.shp
MO_specific_threats.dbf	D210	Database for MO threats
MO_State_border.shp	E34	Shapefile of Missouri state border
MO_streams_metadata.pdf	D116	PDF of metadata for MO streams
MO_UST.shp	E153	Shapefile of Underground Storage Tank Facilities in Missouri
MO_VST_attribute_descriptions.pdf	D117	Metadata for Mo_VST.shp
MO_VST.shp	F84	Shapefile of Valley Segment Types for MO
mo_vst1.shp	D205	Shapefile of all watersheds draining into MO, except the MO & MS Rivers outside of MO
MO_wells.shp	E225	Shapefile of MO wells
moagrd.shp	E449	Shapefile of Missouri National Guard sites
Modeled_Data	E59	Aquatic Gap subfolder containing Habitat Affinities, Species Counts, and Species Lists
moghnwil.shp	F417	NWI Missouri River Main Stem - Glasgow to Hermann line data
moghnwip.shp	F418	NWI Missouri River Main Stem - Glasgow to Hermann polygon data
mohsnwil.shp	F419	NWI Missouri River Main Stem - Hermann to St. Louis line data
mohsnwip.shp	F420	NWI Missouri River Main Stem - Hermann to St. Louis polygon data
mokgnwil.shp	F369	NWI Missouri River Main Stem - Kansas City to Gascow line data
mokgnwip.shp	F370	NWI Missouri River Main Stem - Kansas City to Gascow polygon data
MORAP HTD	B197	MORAP Human Threat Data Folder
MORAP_1900_99_fmcs_data.mdb	G40	MS Access database of fish, mussel, crayfish and snail collections from 1900 to 1999
morap_lulc_05	F54	Folder with MORAP landuse landcover data 05
MoRAP_LULC_05.lyr	F52	MORAP landuse landcover data 05 layer
MORAP1900_99_sampled_segs.shp	G49	Shapefile of stream segments that contain samples contained in the MoRAP_1900_99_fmcs_data.mdb
mostatsgo_dom_surftext_hydgrp.shp	F94	Shapefile of STATSGO soils with dominant surface texture and hydrologica soil group attributes
moupnwil.shp	F361	NWI Missouri River Main Stem line data
moupnwip.shp	F362	NWI Missouri River Main Stem polygon data
MPF.shp	E450	Shapefile of Missouri Prarie Foundation Lands
msalnwil.shp	F318	NWI Middle-South Forks of the Salt River Basin line data
msalnwip.shp	F319	NWI Middle-South Forks of the Salt River Basin polygon data
mtrbnwil.shp	F343	NWI Mississippi River Tributaries -St. Loius - Ste. Genevieve line data
mtrbnwip.shp	F344	NWI Mississippi River Tributaries -St. Loius - Ste. Genevieve polygon data
mtrcnwil.shp	F345	NWI Mississippi River Tributaries - Ste. Genevieve - Cape Girardeau line data
mtrcnwip.shp	F346	NWI Mississippi River Tributaries - Ste. Genevieve - Cape Girardeau polygon data
N_AM_Bird_CI	G76	Folder containing information on the N. Am Bird Conservation Initative
nabci_OZ_sites.shp	H76	Shapefile of N. Am Bird Conservation Initiative: Ozark Bird Conservation Areas
NAIP04	C21	2004 aeriels folder
NAIP05	C22	2005 aeriels folder
NAIP06	C23	2006 aeriels folder

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NAIP07	C24	2007 aeriels folder
NAIP08	C25	2008 aeriels folder
NAIP09	C26	2009 aeriels folder
Natdiv.shp	D492	Shapefile of Missouri's Natural Divisions (Glaciated Plains, Big Rivers, Ozark, etc.)
Natural_Tables	C212	Folder containing the landcover, riparian_landcover, soil_hydro_group, soil_rock_depth, soil_rock_frag, and soil_texture .dbf files
NE_Cert_Wells.shp	F175	Shapefile of Certified wells in Nebraska
NE_LUST.shp	F176	Shapefile of Nebraska leaking underground storage tank sites
NE_wells.shp	E226	Shapefile of registered water wells in Nebraska with the Nebraska DNR
Neighboring_States	E169	Aquatic Gap subfolder containing information on the neighboring states on Missouri
nfabnwil.shp	F320	NWI North Fabious River Basin line data
nfabnwip.shp	F321	NWI North Fabious River Basin polygon data
nfrknwil.shp	F431	NWI North Fork White River Basin line data
nfrknwip.shp	F432	NWI North Fork White River Basin polygon data
nianwil.shp	F401	NWI Niangua River Basin line data
nianwip.shp	F402	NWI Niangua River Basin polygon data
NLCD	C218	Natural Land-cover Database Folder with land-cover information
nlcd_2001	D219,F55	Shapefile of Natl Land Cover Database 2001 land cover layer for mapping zone 38
nlcd_FGDCmetadata.doc	E298	Natural land-cover identification information
nlcdmo	E293	Missouri Natural Land-Cover folder
nlcdmo.lyr	E295	List of the types of vegetation associated with Natural Landcover Land Use Data
nlcdmo_readme.doc	E299	Document of natural land-cover classification system and land-cover class definitions
nodanwil.shp	F363	NWI Nodaway River Basin line data
nodanwip.shp	F364	NWI Nodaway River Basin polygon data
north_mo_segsheds.shp	G85	Shapefile of segmentsheds (local drainage for each Mo_VST stream segment) for Nouth Missouri
NPDES.shp	E154	Shapefile of a subset from EPA's Natl Pollutant Discharge Elimination System/Permit Compliance System (NPDES/PCS) dataset
nps.shp	E451	Shapefile of Natl Park Service unit boundaries
nrthnwil.shp	F322	NWI North River - Bob's Creek Basin line data
nrthnwip.shp	F323	NWI North River - Bob's Creek Basin polygon data
nsalnwil.shp	F324	NWI North Salt River Basin line data
nsalnwip.shp	F325	NWI North Salt River Basin polygon data
NWI	D300	Folder of National Wetlands Inventory data
NWI_META.txt	E305	Metadata explaingin Missouri National Wetlands Inventory Data
NWI_RDME.txt	E308	File containing description of NWI data
NWIL.dbf	E306	NWI (National Wetlands Inventory) lines database (.dbf)
NWIP.dbf	E307	NWI (National Wetlands Inventory) polygon database (.dbf)
Offices.shp	D493	Shapefile of MDC offices
Oil_Gas_Wells.shp	D242	Shapefile of Oil Gass Wells
OzarkTrail.shp	E452	Shapefile of the Ozark Trail
Partner_COAs	F73	Subfolder containing shapefiles of prioriy areas for other organizations
PAT.DBF	E500	Database for MDC basins
perdnwil.shp	F326	NWI Peruque-Dardine River Basin line data
perdnwip.shp	F327	NWI Peruque-Dardine River Basin polygon data
pcs3.shp	E155	Shapefile of Waste Water Treatment Facilities in the state of Missouri
pfl_faunal.bmp	D185	Bitmap of Pliegers faunal regions
Pflieder Faunal Regions.shp	D186	Shapefile of Pflieder's Faunal Regions
Pflieder_Regional_Data	C185	Aquatic Gap subfolder containing pfl_faunal.bmp and Pflieder_Faunal_Regions.shp files
Physical	D90	Aquatic Gap Subfolder containing physical land data for the MoRAP land area.
PioneerForest.shp	E453	Shapefile of the Pioneer Forest
platnwil.shp	F365	NWI Platte River Basin line data
platinwip.shp	F366	NWI Platte River Basin polygon data
pomnwil.shp	F403	NWI Pomme de Terre River Basin line data
pomnwip.shp	F404	NWI Pomme de Terre River Basin polygon data
population_centers.shp	E156	Shapefile of Population Centers
Power_lines.shp	E157	Shapefile of major powerlines in the state of Missouri
Prarie_Chk_FA.shp	F462	Shapefile of areas of high grassland quality, and focus for the greater prairie-chicken habitat
preprair.shp	D473	Shapefile of geo-dataset delineating the areas of Presettlement Prairies of MO
Principle Information Sources.doc	E122	CWCSCOA project References
project initiative descriptions (pdfs)	E124	.pdf of descriptions of project initiatives of the Aquatic Gap: CWCSCOA project
PUBLAND	D445	Statewide subfolder containing public land data for the state of Missouri
publands_06.shp	E35	Shapefile of public lands in Missouri
QLTRPT_2008_L.shp	E193	Missouri Lakes assessed as impaired in 2008
QLTRPT_2008_S.shp	E195	Missouri Streams assessed as impaired in 2008
Quail_FA.shp	F463	Shapefile of areas MDC prioritzed for quail habitat
Rail_Stream_Crossings.shp	D243	Shapefile of locations of rail and stream crossings
Railroads.shp	D244,D474,E158	Shapefile of railroads
RAM_Sampled_segs.shp	G51	Shapefile of selected arcs from the 1:100,000 Natl Hydrography Dataset (NHD) that was developed by the USGS and EPA
RAM Fish.dbf	G41	DBF of RAM fish samples 1994-2005, links to RAM_sampled_segs.shp
RAM INVE.dbf	G42	DBF of macroinvertebrate IBI scores for RAM sites 2002-2005, links to RAM_sampled_segs.shp
RAM PHYS.dbf	G43	DBF of RAM physical habitat and water quality data, links to RAM_sampled_segs.shp

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RAM1994_2005_sample_Locs.shp	G50	Shapefile of 1994-2005 RAM sample locations
Raw_Stressor_Source_Data.docx	E159	More detailed descriptions of the Raw Stressor shapefiles
Raw_Stressor_Data	D131	Subfolder containing shapefiles of various human stressors
RCRIS.shp	D245	Shapefile of Resource Conservation Recovery Act (RCRA) sites covering EPA Region 7 - extracted from a subset from EPA's Geodata dataset obtained from the EPA envirofacts website
RCRIS_noTri.shp	E160	Shapefile of Resource Conservation Recovery Act (RCRA) sites covering EPA Region 7 - extracted from a subset from EPA's Geodata dataset obtained from the EPA envirofacts website without the Toxic Release Inventory
README.TXT	E309	NWI .txt file containing information about the Missouri National Wetlands Inventory Data
reduced_attributes_evallpt.shp	E289	Shapefile of evallpt.shp with reduced attributes
Region	C262	Statewide subfolder containing regional data for Missouri
regions.shp	D494	Shapefile of MDC regions
Relief	C220	Relief grid for Missouri
relief.lyr	F95	Relief values for the Relief gird for Missouri
Resource Science	D458	Statewide Server subfolder containing the MDC_Data_to_2006. shp file
riparian_landcover.dbf	D213	DBF contains information about the amount of each landcover class quantified for the local catchment and upstream drainage area in the Mo_VST.shp shapefile
rivers.shp	D475	Shapefiel of rivers
Road_Stream_Crossings.shp	E161,D246	Shapefile of locations of road and stream crossings
Roads.shp	E162,D199,E259	Shapefile of roads
sacnwil.shp	F405	NWI Sac River Basin line data
sacnwip.shp	F406	NWI Sac River Basin polygon data
SCANMAP.TIF	E260	County-specific map containing information on Township, Range, and Section
schooldist.shp	D476	Shapefile of the boundaries of the school districts of MO
sections.shp	D477	Shapefile of the boundaries of the Public Land Survey System (PLSS) Sections and Land Grants within the State of MO
Segmentsheds	F85	Subfolder containing shapefiles segmentsheds for Missouri
sfabnwil.shp	F329	NWI South Fabious River Basin line data
sfabnwip.shp	F330	NWI South Fabious River Basin polygon data
sgranwil.shp	F407	NWI South Grand River Basin line data
sgranwip.shp	F408	NWI South Grand River Basin polygon data
short_dictionary.doc	E290	Document of Heritage GIS Shapefile Data Dictionary (short version)
soil_hydro_group.dbf	D214	DBF table contains information about the amount of each soil hyrological group (8 class) quantified for the local catchment and upstream drainage area for each stream segment in the Mo_VST.shp shapefile
soil_rock_depth.dbf	D215	DBF table contains information about the amount of each soil depth to bedrock (7 class) quantified for the local catchment and upstream drainage area for each stream segment in the Mo_VST.shp shapefile
soil_rock_frag.dbf	D216	DBF table contains information about the amount of each soil rock fragment volume class (12 class) quantified for the local catchment and upstream drainage area for each stream segment in the Mo_VST.shp shapefile
soil_texture.dbf	D217	DBF table contains information about the amount of each soil texture class (12 class) quantified for the local catchment and upstream drainage area for each stream segment in the Mo_VST.shp shapefile
south_mo_segsheds.shp	G86	Shapefile of segmentsheds (local drainage for each Mo_VST stream segment) for south Missouri
Species_Counts	F64	Aquatic Gap sub-folder containing the AESCNTM.acocdb file
Species_Lists	F65	Aquatic Gap sub-folder containing the LRCHAM.dbf, LRCHEM.dbf, LRCHSM.dbf and LRCHSM_LNiangua.dbf files
speciesbyseg.dbf	D182	Database file containing species classified by Little Niangua segments
speciesxseg_sum.dbf	D183	Database file containing species classified by sex in Little Niangua segments
springs.shp	F105	Shapefiles of known springs in Missouri
sprnwil.shp	F443	NWI Spring River Basin line data
sprnwip.shp	F444	NWI Spring River Basin polygon data
sprwnwil.shp	F433	NWI Spring River Basin (White River) line data
sprwnwip.shp	F434	NWI Spring River Basin (White River) polygon data
st_qltrpt_2008_L	D193	Subfolder of impaired waters that lists Lakes on the 2008 305(b)
st_qltrpt_2008_S	D195	Subfolder of impaired waters that lists Streams on the 2008 305(b)
State	C484	Statewide server data sub-folder containing information on the entire state of Missouri
State_Pools.shp	F277	Shapefile of the assessment of MO's Trout Management Areas - pools
State_Riffles.shp	F278	Shapefile of the assessment of MO's Trout Management Areas - riffles
STATES.shp	D200	Shapefile of the U.S. States - 50 states and the District of Colombia of the U.S.
statewide_aquatic_irreplace.dbf	D5	Fish, Mussel, and Crayfish Irreplaceability Database
Statewide Counties	D256	List of counties in the state of Missouri
Statewide Server Data	B255	Primary Folder that contains information on the state of Missouri
STATEWIDE.dbf	G44	MS Access database that contains the MoRAP and RAM fish collections
stjbnwil.shp	F355	NWI Saint Johns Bayou line data
stjbnwip.shp	F356	NWI Saint Johns Bayou polygon data
stlouis_winter_areas.shp	F279	Shapefile of St. Louis conservation areas pertaining to trout programs
Stream Team Monitoring Sites	B509	Folder with Stream Team Monitoring Sites
Stream_Network.gdb	D202	MoRAP Base Data subfolder containing information on streams pertaining to the MoRAP Human Threat Data (i.e. stream lines, junctions, etc.)
Stream24	D459	Folder with 24K stream networks
Streams_303(d)_2006	C194	Folder with 303d streams
Streams_305(b)_2008	C195	Folder with 305b streams
STRM_TM_VVQM.dbf	C509	Stream Team Volunteer Water Quality Monitioring database
STRM_TM_VVQM.shp	C510	Stream Team Volunteer Water Quality Monitioring sties shapefile
Sum_Output.dbfs (0-11)	D184	Aquatic Gap Little Niangua database file
Superfund.shp	D247	Superfund sites shapefile
tarknwil.shp	F367	NWI Tarkio-Squaw Tributaries Basin line data
tarknwip.shp	F368	NWI Tarkio-Squaw Tributaries Basin polygon data
Terrestrial_ECS	E87	Subfolder containing shapefiles of Terresrial Ecological Classification Units
theme2.shp	E505	MO watersheds
thomnwil.shp	F375	NWI Upper Thompson River Basin line data
thomnwip.shp	F376	NWI Upper Thompson River Basin polygon data

Data Index and Metadata


Threat_Data_1	C221	Folder containing MORAP threat data
Threat_Data_2	C250	Folder containing MORAP threat data
Threat_Tables	C252	Folder containing MORAP threat data databases
TIC.DBF	E501	Database for MDC basins
tlaknwil.shp	F435	NWI Table Rock Lake Basin line data
tlaknwip.shp	F436	NWI Table Rock Lake Basin polygon data
tnc.shp	E454	Shapefile of The Nature Conservancy lands in MO (not including conservations easements, leases, or closed to public)
tnc_aquatic_priorities.shp	H77	Shapefile of The Nature Conservancy aquatic priorities
TNC_Portfolios	G77	Shapefile of TNC ecoregional priorities
tnc_terrestrial_priorities.shp	H78	Shapefile of the Nature Conservancy terrestrial priorities
TOPO	C507	Folder containing orthophotoquads by city
TopoBoundaries.shp	D495	Shapefile of the extent of a USGS 1:24,000, 1:100,000, and 1:250,000 scale quadrangles for MO
towers.shp	D478	Shapefile of MDC relay towers
Toxic_Releases.shp	D248	Shapefile of Toxic Release sites (all Toxic Release sites excepting those classed as (RCRA) or (CERCLIS))
TRI.shp	E164	Shapefile of Toxic Release sites
Trout	E263	Folder containing shaperiles of trout stocking areas
TRS_boundaries.shp	E36	Shapefile of Township, Range, and Section boundaries for Missouri
ugasnwil.shp	F409	NWI Upper Gasconade River Basin line data
ugasnwip.shp	F410	NWI Upper Gasconade River Basin polygon data
ugranwil.shp	F377	NWI Upper Grand River Basin line data
ugranwip.shp	F378	NWI Upper Grand River Basin polygon data
units.shp	D496	Shapefile of the MO County Boundary shapefile
upchnwil.shp	F379	NWI Upper Chariton River Basin line data
upchnwip.shp	F380	NWI Upper Chariton River Basin polygon data
uposnwil.shp	F411	NWI Upper Osage River Basin line data
uposnwip.shp	F412	NWI Upper Osage River Basin polygon data
USFS	G79	Shapefile of USFS ecosystem management areas
usfs.shp	E455	Shapefile of US Forest Service land
usfs_eco_mgtt_areas.shp	H79	US Forest Service ecological management areas shapefile
usfs_RangerDistricts.shp	E456	Shapefile of Mark Twain Natl Forest Ranger Districts
usfws.shp	E457	US Fish and Wildlife Service lands shapefile
ustfnwil.shp	F357	NWI Upper Saint Francis Basin line data
ustfnwip.shp	F358	NWI Upper Saint Francis Basin polygon data
villages.shp	D479	Shapefile of a geo-dataset describing specific places of MO, data are Level 2 extensions of Level 1 USGS GNIS data
votelist.shp	D480	Shapefile of voting districts
VST_Human_Stressor_Source_Data.pdf	D118	Overview of the source data used to generate local and watershed stressor statistics for each stream segment
VST_Local_watshed_lulc	F56	Folder containing Aquatic Gap Landuse Landcover databases
VST_Local_Watshed_Physical	F98	Folder containing vst_phy_inlet_watshed.dbf and vst_phy_outlet_watshed.dbf
vst_lulc9293_inlet_watshed.dbf	G56	Aauatic Gap Landuse Landcover database
vst_lulc9293_local.dbf	G57	Aquatic Gap Landuse Landcover database
vst_lulc9293_outlet_watshed.dbf	G58	Aquatic Gap Landuse Landcover database
VST_own_steward.dbf	F37	DBF table of public ownership and GAP stewardshop attributes for each stream segment, links/joins to Mo_VST.shp via Seg_ID
VST_Owner_Steward	E37	Folder containing public ownership and GAP
vst_phy_inlet_watshed.dbf	G98	DBF file that contains <u>watershed</u> geology, soil, and relief statistics for the <u>outlet</u> of each stream segment
vst_phy_outlet_watshed.dbf	G99	DBF file that contains geology, soil, and relief statistics for the <u>local immediate drainage (segmentshed)</u> of each stream segment.
vst_phy_segshed_local.dbf	G100	DBF file that contains <u>watershed</u> geology, soil, and relief statistics for the <u>outlet</u> of each stream segment
VST_Stressor_Data	D177	Folder containing Aquatic Gap VST stressor databases
vst_stressors_inlet_watshed.dbf	E177	Aquatic Gap Stressor database
vst_stressors_local.dbf	E178	Aquatic Gap Stressor database
vst_stressors_outlet_watshed.dbf	E179	Aquatic Gap Stressor database
Waste_Water_Treatment.shp	E165	Shapefile of Aquatic Gap wastewater treatment sites
Water	E101	Subfolder containing shapefiles pertaining to Missouri's water resources
Water Quality and Biological Database Links.pdf	D18	Links to water quality and biological databases
Water_transfer_stations.shp	E166	Shapefile of locations for all permitted solid waste tansfer stations in Missouri
watrbody.shp	D481	shapefile of impoundments
wetland_complexes.shp	F106	Shapefile of major wetland complexes in Missouri
wfoxnwil.shp	F331	NWI Wyaconda-Fox River Basin line data
wfoxnwip.shp	F332	NWI Wyaconda-Fox River Basin polygon data
whitnwil.shp	F437	NWI White River Basin line data
whitnwip.shp	F438	NWI White River Basin polygon data
Wildlife	D460	Folder containing MDC wildlife focus areas shapefiles
Wrp_a_mo.shp	D497	Shapefile of the bounding polygons of easements on land as part of the USDA-NRCS' Wetland Reserve Program
wtrshd11.shp	D482	Shapefile of a geo-dataset delineating the 11-digit hydrologic units of MO
wtrshd12.shp	D483	Shapefile of a complete digital hydrologic unit boundary layer to the Subwatershed (12-digit) 6th level for the State of MO
WTRSHEDS	D502	Folder containing HUC 12 watersheds
WWTF.shp	D249	Shapefile of features that had a Standard Industrial Code (SIC) code corresponding to Waste Treatment Facilities, extracted from EPA's NPDES/PCS dataset
Zipcodes.shp	D498	Shapefile of zipcodes

Guide Sheet 1: GIS Watershed Characterization

(Watershed delineation and basic characterization using GIS datasets)

GIS Watershed Characterization

This instruction guide delineates a Watershed in Johnson County – Clear Fork Creek. You can use these instructions to navigate to your own watershed and follow the steps that are outlined

1. Add the TOPO map(s) for the given area in which the watershed resides using the Add Data Tool . Use the Data Structure Layout to locate all the necessary data for your map. Adding the streams and road shapefiles can also be useful.

*The Data Structure Layout refers to the file folder system of the hard drive in which the instruction sheet data resides. See the instructions for Mapping to a Drive if you are not connected to the external hard drive. The hard drive indicator: 'XHD' refers to the drive letter on any given computer portal. Note, these letters may differ from computer to computer, but for all of these guidesheets, the drive will be referred to as 'XHD'.

- a. The easiest way to narrow down the TOPO(s) that the watershed resides in is to navigate to DRGcatv9.dbf- (XHD:\GIS\Statewide Server Data\TOPO). Double click to open it into the map (Figure 1-1).

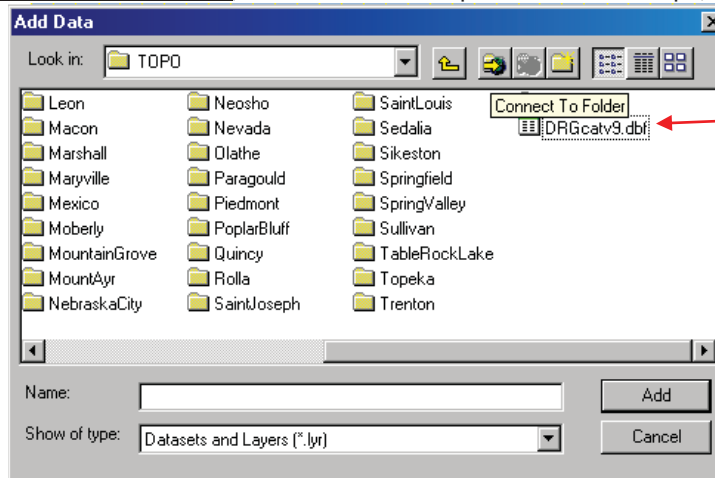


Figure 1-1

- b. Using the identify tool (1) (Figure 1-2), identify the general area of your watershed by clicking a square in the watershed vicinity. (For this exercise, you may need to click multiple squares until you find the TOPO that is appropriate for you project; (you may need to add multiple TOPO(s) to encompass your watershed.)

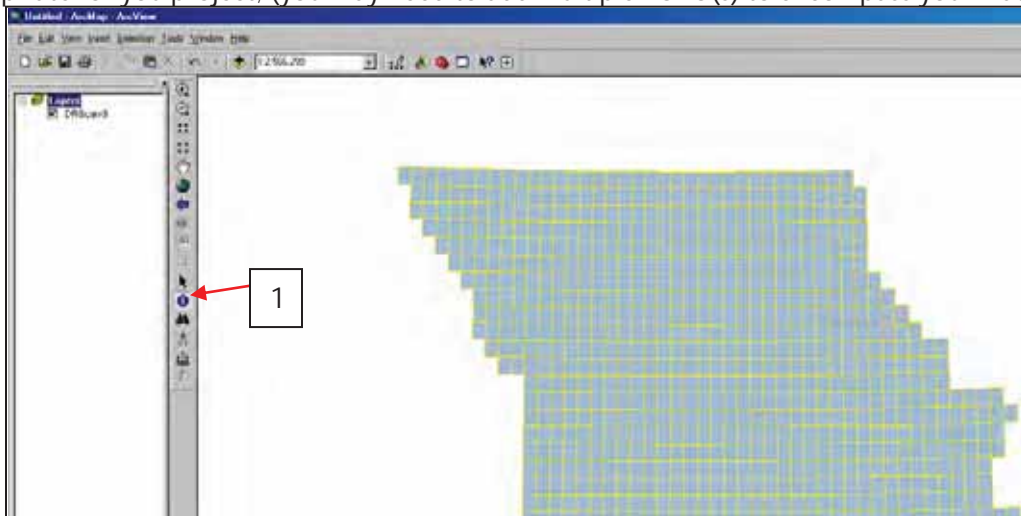


Figure 1-2

c. The following should appear after clicking the .tif square with the identify tool. (Figure 1-3)

*If you are having problems identifying the TOPO, change the drop down box (1)(Figure 1-3) to DRGcatv9

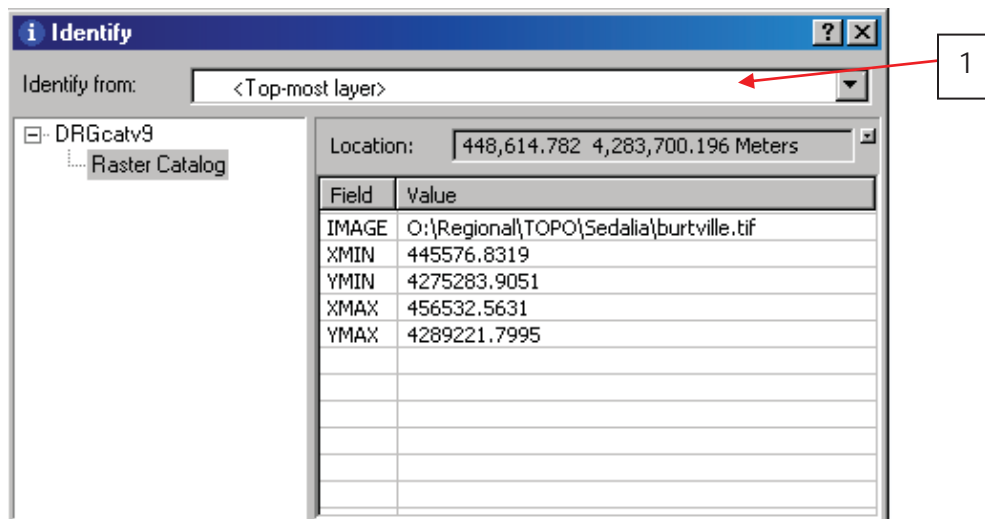



Figure 1-3

d. You will see under the Value column in the IMAGE Field: the correct name of the TOPO for the square you clicked on. Using your Data Structure Layout navigate to the appropriate TOPO map(s). (i.e. Sedalia-burtville.tif) - (XHD:\GIS\Statewide Server Data\TOPO) With this information proceed to use the Add Data Tool  and add your map (s).

*For this example, we used the Sedalia-cornelia.tif, warrensburge.tif, and knobnoster.tif – (XHD:\GIS\Statewide Server Data\TOPO\Sedalia) as well.

e. Now, with the TOPO map(s) added, uncheck the DRGcatv9.tif file (1) from the ArcMap table of contents (Figure 1-4).

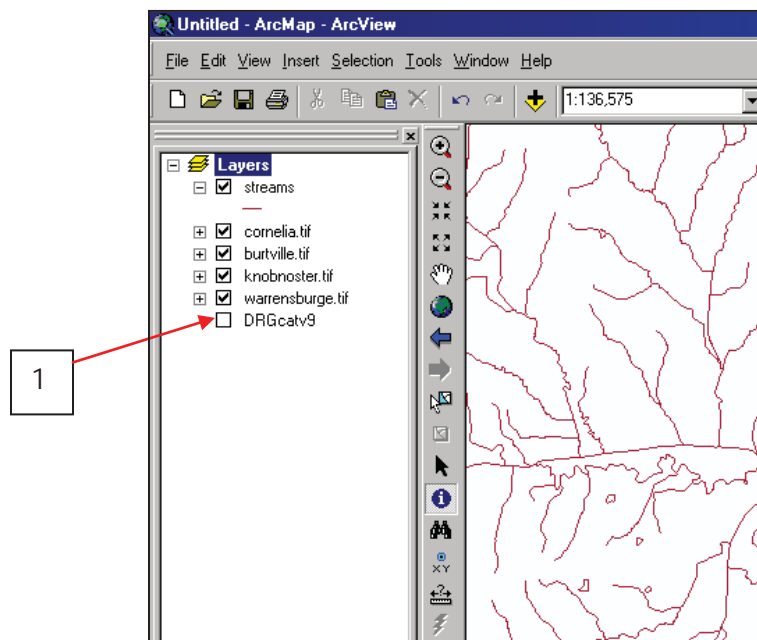


Figure 1-4

f. Before beginning to delineate the watershed, the necessary MoRAP components will need to be added to the map. Add the following layers: Stream_Network.gdb - lines (XHD:\GIS\MORAP HTD\Base Data), movst1.shp (XHD:\GIS\MORAP HTD\Base Data), mo_catchments.shp (XHD:\GIS\MORAP HTD\Base Data), and Road_Stream_Crossing.shp (XHD:\GIS\MORAP HTD\Threat_Data1)

*Adding a recent aerial image may also help you locate the stream. Use the Add Data Tool and Data Structure Layout to navigate to and open the appropriate files (XHD:\GIS\Aerial Data).

2. Delineating the watershed.

a. (Figure 2-1) zoom to the most downstream portion of your watershed using your zoom tools →

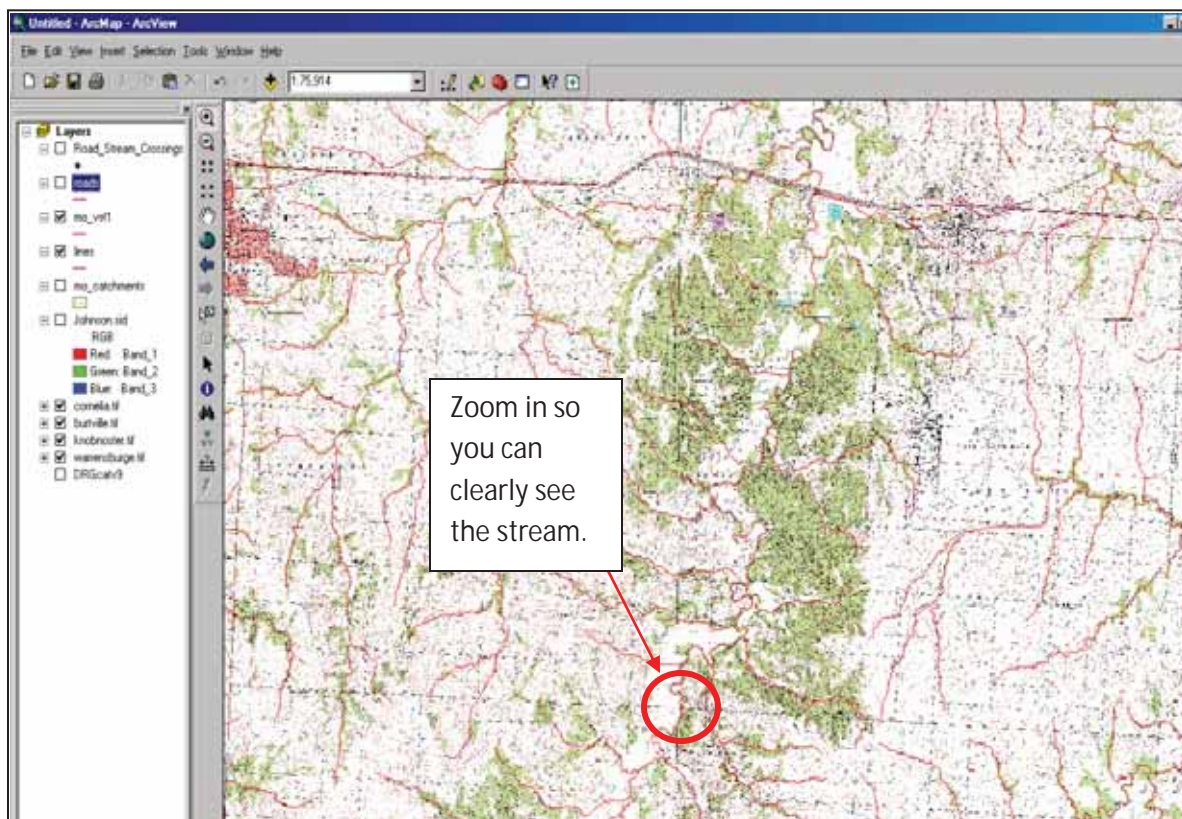


Figure 2-1

- b. Turn on the **Utility Network Analyst** toolbar by right clicking the grey area towards the top of ArcMap (1) (Figure 2-2). Scroll down until you see **Utility Network Analyst** (2) and click it to open. Once opened, the **Utility Network Analyst** toolbar can be moved anywhere on the screen (3).

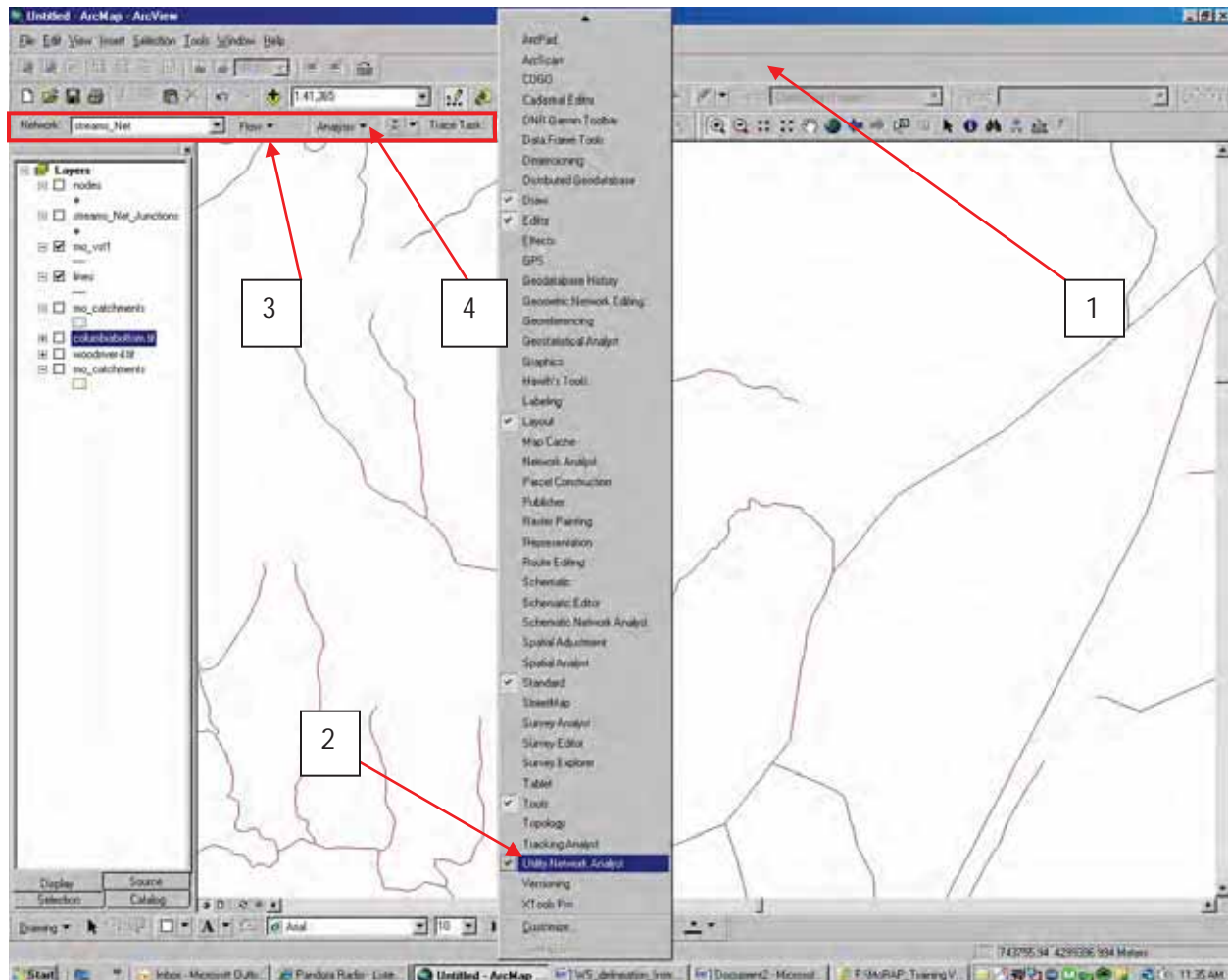


Figure 2-2

Now with the **Utility Network Analyst toolbar**, select the **Analysis** dropdown menu (4) (Figure 2-2) and select **Options**.

- c. In Analysis Options Box, change **Results format** from Drawings to Selection (1)(Figure 2-3). Ensure that under **Results content**, All features and Edges are selected. Select OK.

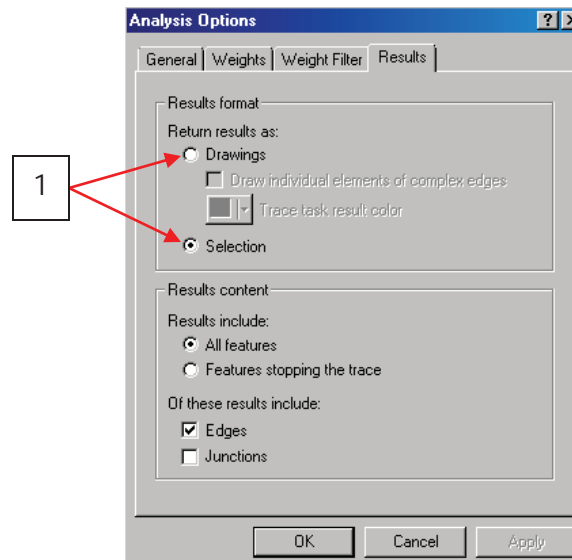


Figure 2-3

- d. Under the **Add Junction Flag** toolbox, select the **Add edge flag** tool button (Figure 2-4).

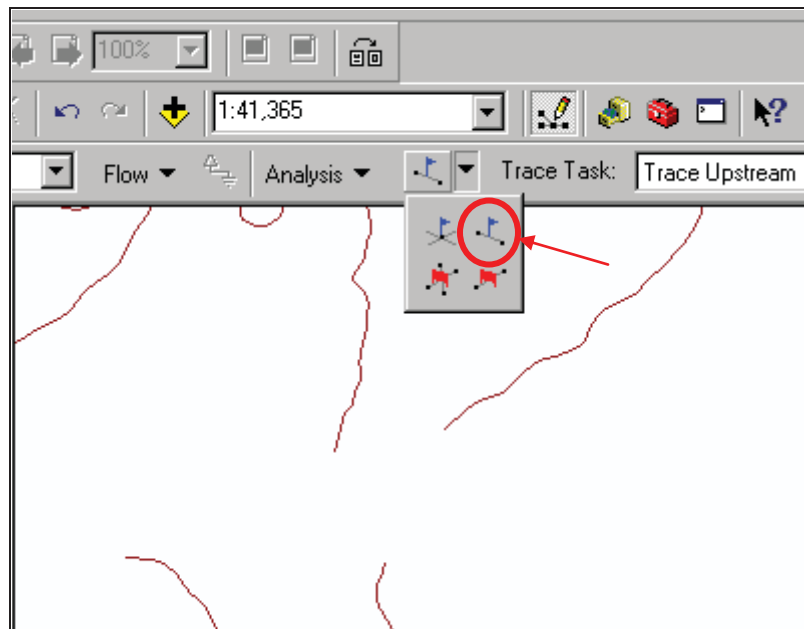


Figure 2-4

- e. You are now ready to add the flag to the bottom most point of the watershed you want delineated. With the **Add Edge Flag** tool selected, click on the stream line at the location from which you would like the watershed to be delineated upstream. (all waterways included in the MORAP dataset that flow into this stream section will be delineated; nothing downstream)

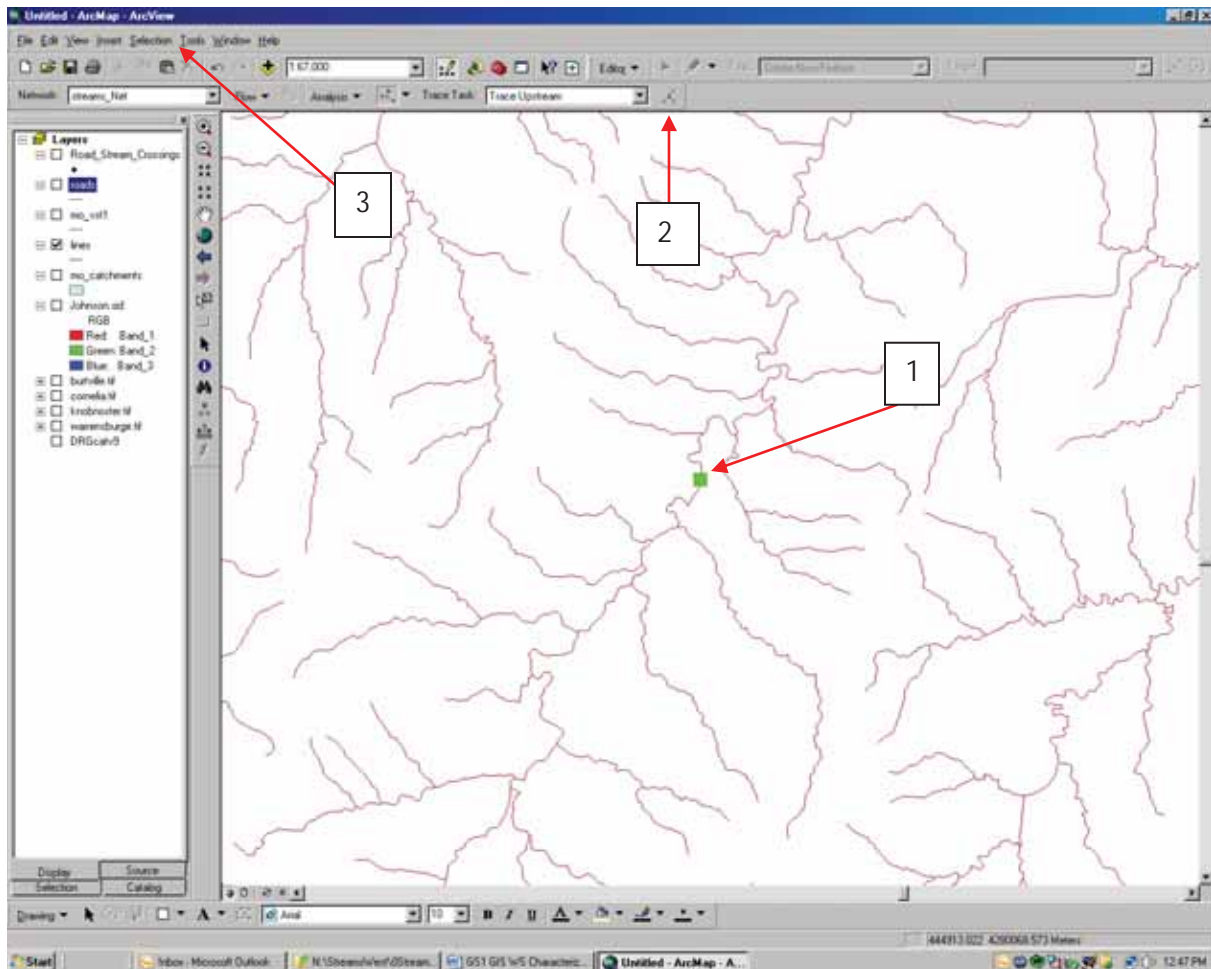


Figure 2-5

- f. Under the **Utility Network Analysis** toolbar in the **Trace Task Dropdown** menu, select **Trace Upstream**. When finished, select **Solve** (2) (Figure 2-5).
- g. Now, go to the **Selection** (3) (Figure 2-5) drop down menu from the main menu at the top of ArcMap, and **Select by Location**.

- h. In the **Select by Location** box, you'll want to use the drop down arrow to 'select features from' then check [mo_catchments]. Then use the drop down near the bottom to select [intersect], then select [lines] in the bottom drop down menu. Press Apply, then OK (Figure 2-6).



Figure 2-6

- i. Now, right click on **mo_catchments** in the Layer column on the left, and select [Data → Export Data] (Figure 2-7) and designate a folder to export the data to. Name it something along the lines of WS_EX because this watershed will show the sub watersheds within its boundaries. When completed, a prompt will ask you if you want to add the exported data as a layer. Choose Yes.

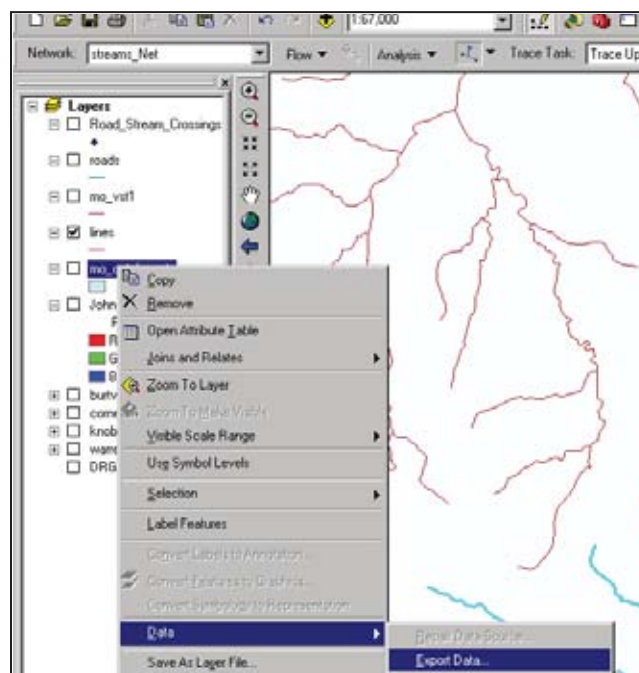


Figure 2-7

- j. Click the check box next to the new layer to make it visible on the screen. For this example, the sub-watersheds shape file looks like Figure 2-8.
- k. To combine all of the sub-watersheds into a shapefile of the watershed as a whole, right click **mo_catchments** and select [Data → Export Data] just like in step 2i. Designate a folder and name the exported data (ie. XriverWS). When completed, a prompt will ask if you want to add the exported data as a layer. Choose Yes. This layer will look exactly the same as the last one you created until the next step.
- l. Now, to combine all of the smaller sub-watersheds in your shapefile (ie. XriverWS), right click the shapefile layer (1) (Figure 2-9) and go to [Selection→Select All] (2). Now open the **Editor toolbar**. (If the editor toolbar is not visible, open it like you did the **Utility Network Analyst** toolbar earlier on page 5 of this guide sheet). Click on the editor dropdown arrow, select [start editing] (1) (Figure 2-10).

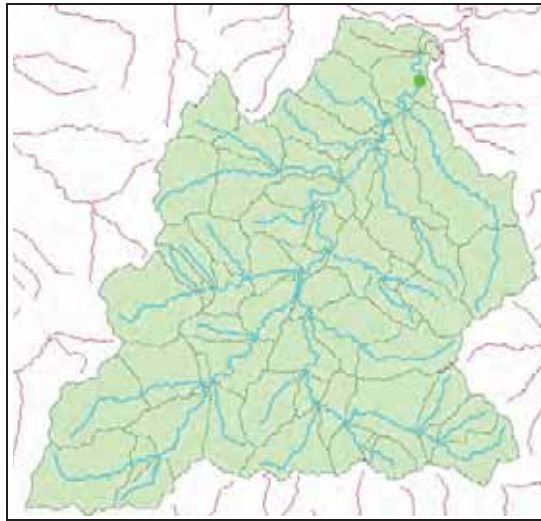


Figure 2-8

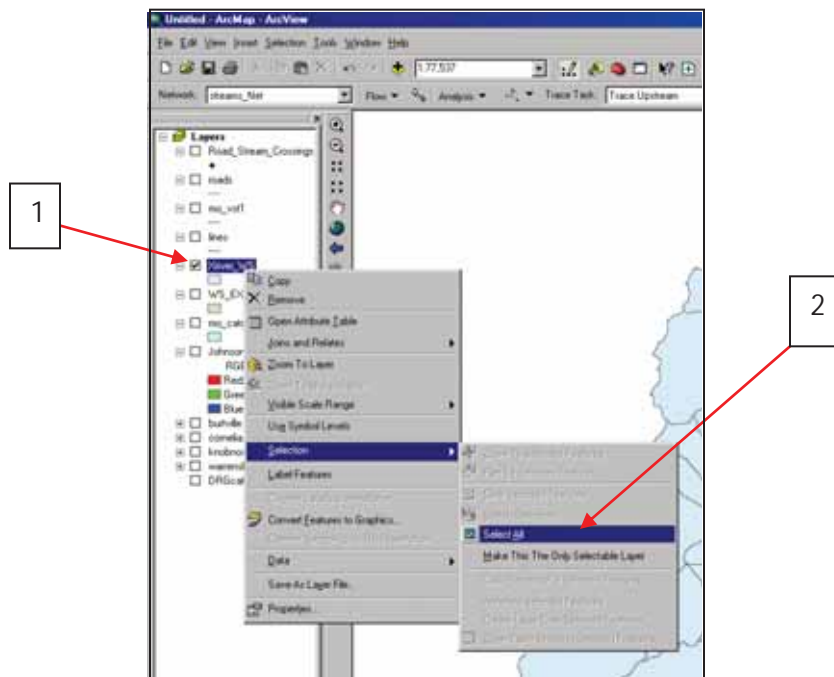


Figure 2-9

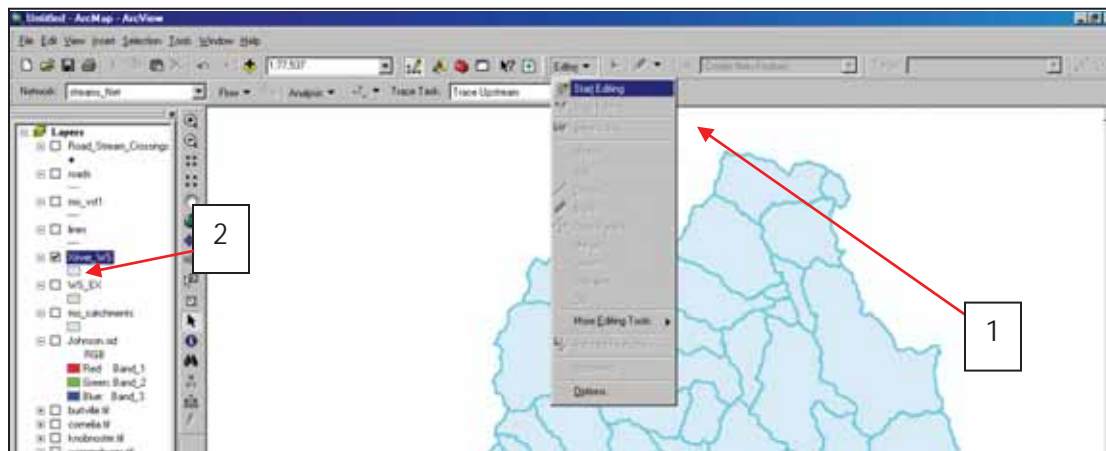


Figure 2-10

- m. Navigate to the file where you saved the watershed shapefile (ie. XriverWS). Select it and choose OK (Figure 2-11).

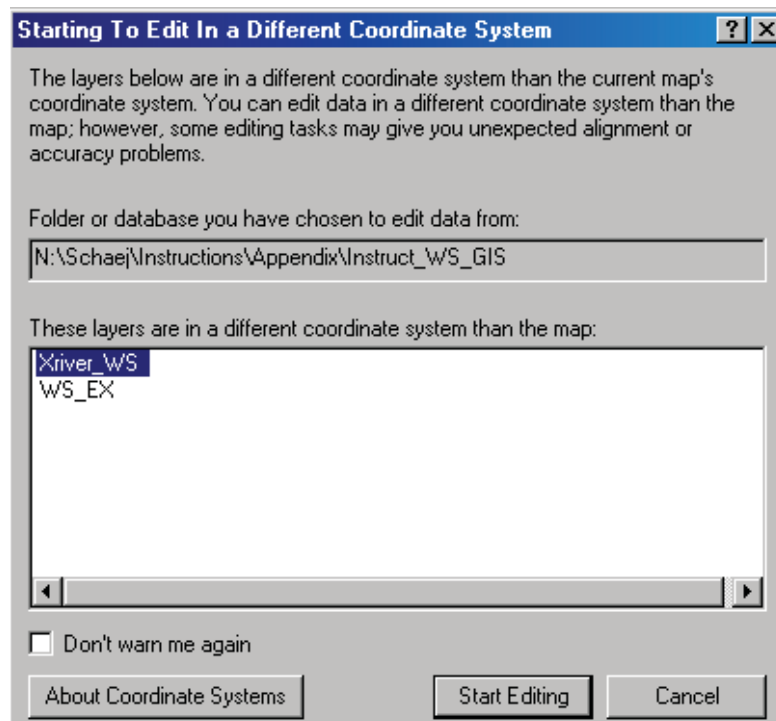


Figure 2-11

- n. Now, under the **Editor drop down menu**, choose [Merge] (Figure 2-12).

Note: If Merge does not appear as an option, choose Stop Editing and, again, right click the XriverWS layer in the table of contents and choose Selection > Select All. Then try to edit and merge the features again.

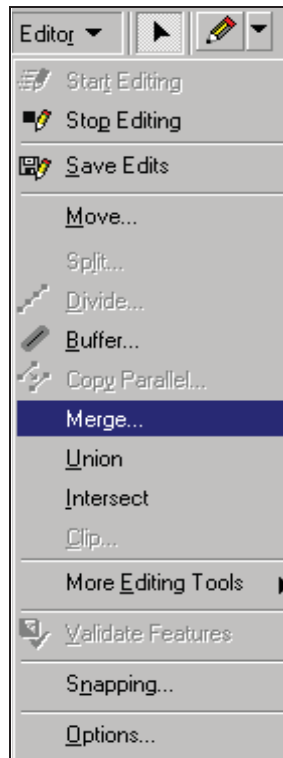


Figure 2-12

- o. After selecting Merge, a Merge options box will appear asking which features are to be merged. Click OK to select them all. (Figure 2-13)

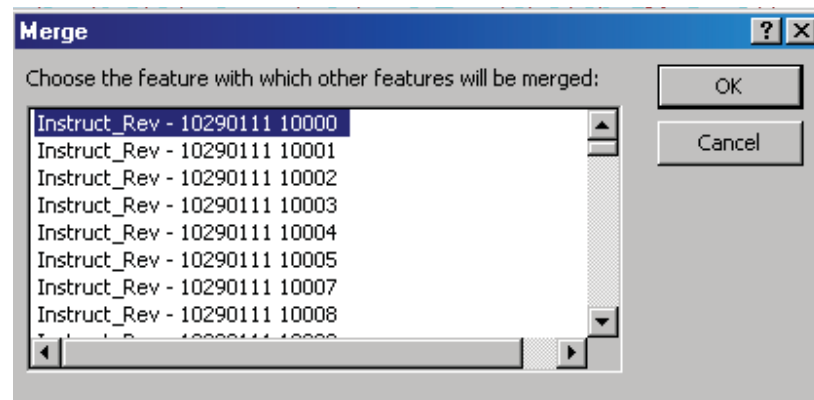
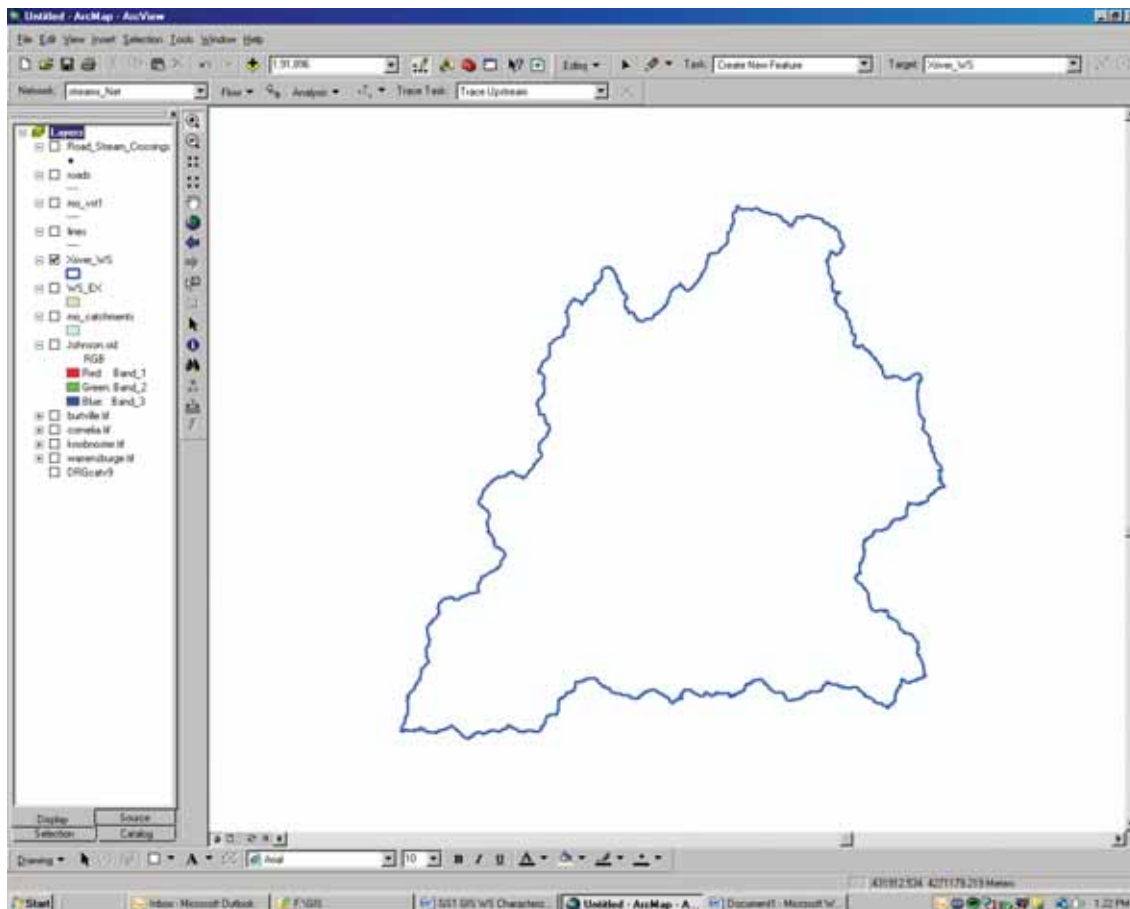



Figure 2-13

- p. You now have your watershed delineated. Double click on the symbol of your merged watershed in the layer pane (2) (Figure 2-10) and select a hollow box as an outline of your watershed so you can see the maps through it. You may also want to change the line color and thickness to make it more easily visible. For this example, the merged watershed looks like Figure 2-14.



3. You may now want to add some additional basic layers to your ArcMap project.
 - a. As mentioned earlier, you can add aerial images to your ArcMap using the Add Data Tool . Now, to ensure that the created watershed overlays the aerial images, click and drag the watershed layer (in the ArcMap table of Contents) above the aerial image files that you added. Zoom in and out of the watershed to get a feel of the land-use practices from the aerials. To see changes in the watershed over time, add arials from multiple years, turning them on and off to compare.

- b. You may also want to add the 303(d) Impaired Streams layer to see if any of the streams in the watershed have been identified as impaired by MDNR as of 2006. Navigate to the Impaired Streams Layer by using the following route: (XHD:\GIS\Impaired Waters\Streams 303(d) 2006)

-With the 303(d) layer added, make sure the line color is visible over the map so that impaired stream segments will show up. If you see 303(d) streams appear within your watershed boundary click on the **Select Features** button (1) (Figure 3-1) then click on the impaired stream segment. This should highlight the segment.

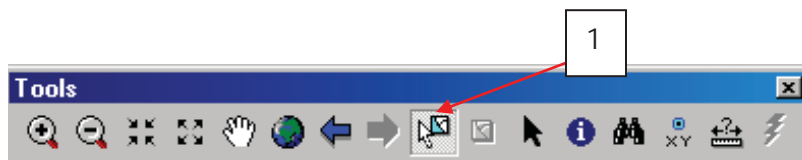


Figure 3-1

Then right click on the 303(d) layer in the layer pane on the left. Click on **Open Attribute Table**. At the bottom of the table is an area that reads Show: All or Selected. Click on the **Selected** button (1) (Figure 3-2). The information on the stream segment and impairment should now appear highlighted on the table.

FID	Shape	YR	WBD_GIS	WBD	WATERBODY	CLS	SZ	POLLUTANT	SOURCE
0	Polyline ZM	2006	31000	3100	N. Fk. Spring River	C	51.5	Low D.O.	Lamar WWTP
1	Polyline ZM	2006	31000	3100	N. Fk. Spring River	C	51.5	Low D.O.	Lamar WWTP
2	Polyline ZM	2006	31000	3100	N. Fk. Spring River	C	51.5	Low D.O.	Lamar WWTP
3	Polyline ZM	2006	31000	3100	N. Fk. Spring River	C	51.5	Low D.O.	Lamar WWTP
4	Polyline ZM	2006	31000	3100	N. Fk. Spring River	C	51.5	Low D.O.	Lamar WWTP
5	Polyline ZM	2006	31000	3100	N. Fk. Spring River	C	51.5	Low D.O.	Lamar WWTP
6	Polyline ZM	2006	31000	3100	N. Fk. Spring River	C	51.5	Low D.O.	Lamar WWTP
7	Polyline ZM	2006	31000	3100	N. Fk. Spring River	C	51.5	Low D.O.	Lamar WWTP
8	Polyline ZM	2006	31000	3100	N. Fk. Spring River	C	51.5	Low D.O.	Lamar WWTP
9	Polyline ZM	2006	31000	3100	N. Fk. Spring River	C	51.5	Low D.O.	Lamar WWTP
10	Polyline ZM	2006	31000	3100	N. Fk. Spring River	C	51.5	Low D.O.	Lamar WWTP
11	Polyline ZM	2006	31000	3100	N. Fk. Spring River	C	51.5	Low D.O.	Lamar WWTP
12	Polyline ZM	2006	31000	3100	N. Fk. Spring River	C	51.5	Low D.O.	Lamar WWTP
13	Polyline ZM	2006	31000	3100	N. Fk. Spring River	C	51.5	Low D.O.	Lamar WWTP
14	Polyline ZM	2006	31000	3100	N. Fk. Spring River	C	51.5	Low D.O.	Lamar WWTP
15	Polyline ZM	2006	31000	3100	N. Fk. Spring River	C	51.5	Low D.O.	Lamar WWTP
16	Polyline ZM	2006	31000	3100	N. Fk. Spring River	C	51.5	Low D.O.	Lamar WWTP
17	Polyline ZM	2006	31000	3100	N. Fk. Spring River	C	51.5	Low D.O.	Lamar WWTP
18	Polyline ZM	2006	31000	3100	N. Fk. Spring River	C	51.5	Low D.O.	Lamar WWTP
19	Polyline ZM	2006	31000	3100	N. Fk. Spring River	C	51.5	Low D.O.	Lamar WWTP
20	Polyline ZM	2006	31000	3100	N. Fk. Spring River	C	51.5	Low D.O.	Lamar WWTP
21	Polyline ZM	2006	31000	3100	N. Fk. Spring River	C	51.5	Low D.O.	Lamar WWTP
22	Polyline ZM	2006	31000	3100	N. Fk. Spring River	C	51.5	Low D.O.	Lamar WWTP
23	Polyline ZM	2006	31000	3100	N. Fk. Spring River	C	51.5	Low D.O.	Lamar WWTP
24	Polyline ZM	2006	31000	3100	N. Fk. Spring River	C	51.5	Low D.O.	Lamar WWTP
25	Polyline ZM	2006	31000	3100	N. Fk. Spring River	C	51.5	Low D.O.	Lamar WWTP
26	Polyline ZM	2006	31000	3100	N. Fk. Spring River	C	51.5	Low D.O.	Lamar WWTP
27	Polyline ZM	2006	31000	3100	N. Fk. Spring River	C	51.5	Low D.O.	Lamar WWTP
28	Polyline ZM	2006	31000	3100	N. Fk. Spring River	C	51.5	Low D.O.	Lamar WWTP
29	Polyline ZM	2006	31000	3100	N. Fk. Spring River	C	51.5	Low D.O.	Lamar WWTP
30	Polyline ZM	2006	31000	3100	N. Fk. Spring River	C	51.5	Low D.O.	Lamar WWTP

Figure 4-3

- c. You can continue to explore data layers that you think may be valuable in characterizing your watershed by looking at the Data Structure Layout and reading the descriptions of the data available to add to your project.

Guide Sheet 2:

Watershed Landuse

(Using 2005 landcover data to get a basic description of land use percentages in the watershed)

Determining Watershed Landuse Percentages

1. Using ArcMap and the Add Data Tool, add the Lulc05.lyr data file. (XHD:\GIS\Statewide Server Data\Region\Landcov) (Figure 1-1).

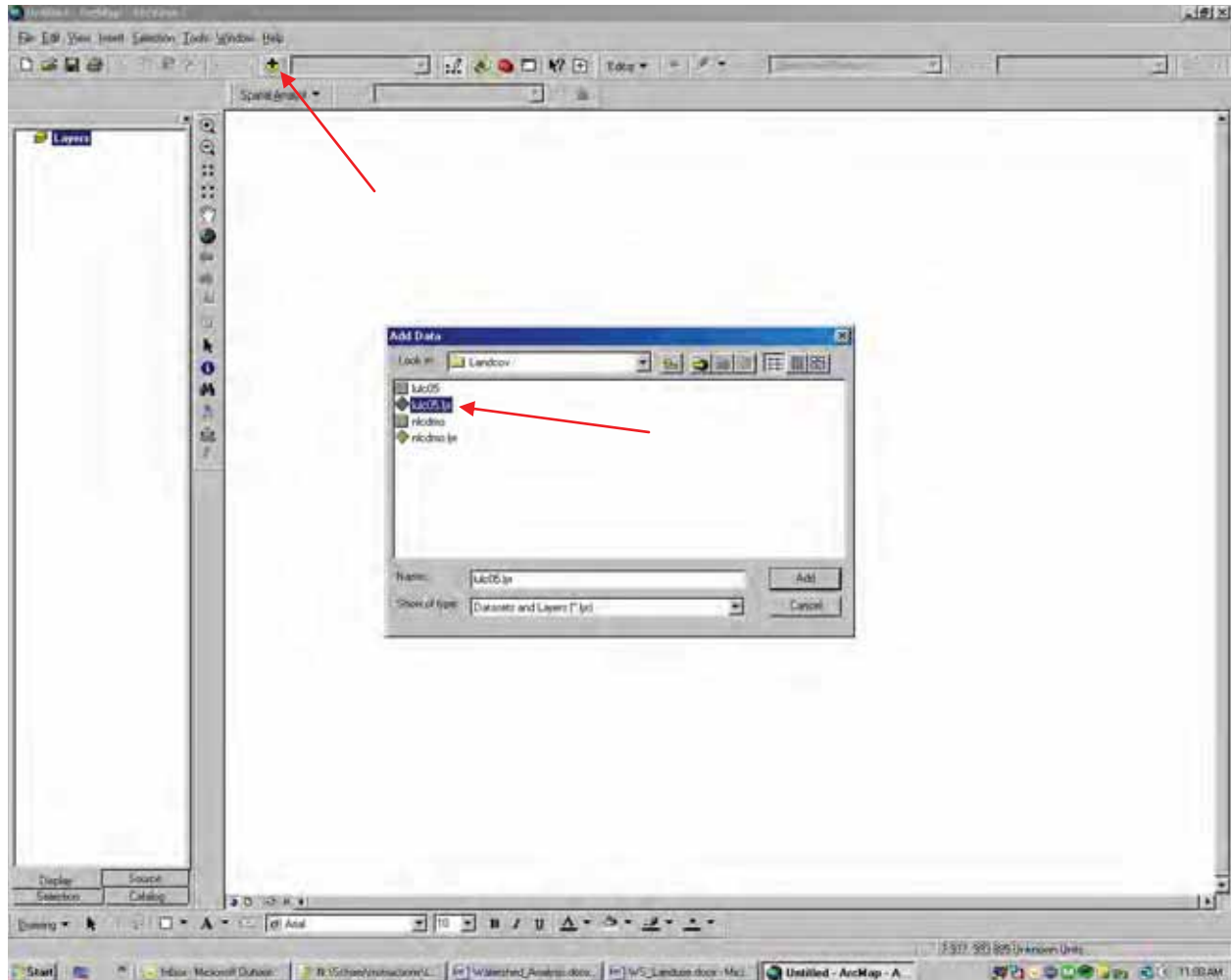


Figure 1-1

- a. If a red exclamation mark appears next to lulc05 in the ArcMap table of contents, you will need to repair the data source.
 - a. Right click lulc05 in the table of contents and select Data > Repair Data Source (Figure 1-2)

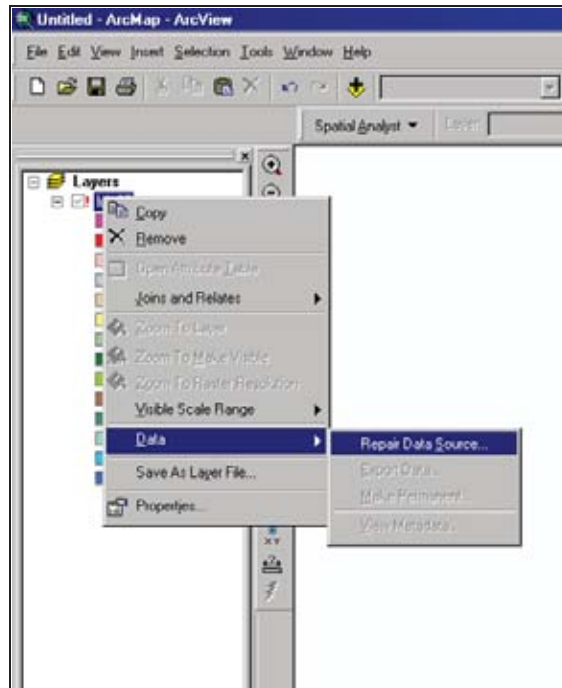


Figure 1-2

- b. In the following screen, highlight lulc05 and select Add. The data source should now be repaired.

2. Add the shapefile of the watershed delineated in previous guide sheets. Right click its title in the table of contents and select Zoom To Layer in order that the screen displays your watershed (Figure 2-1).

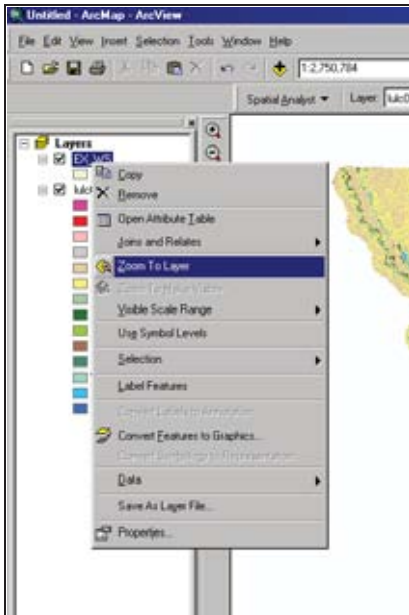


Figure 2-1

- a. Because the watershed was delineated in a different coordinate system, it will have to be exported to match the coordinate system of lulc05. In the ArcMap table of contents, right click the watershed shapefile and select Data > Export Data (Figure 2-2).

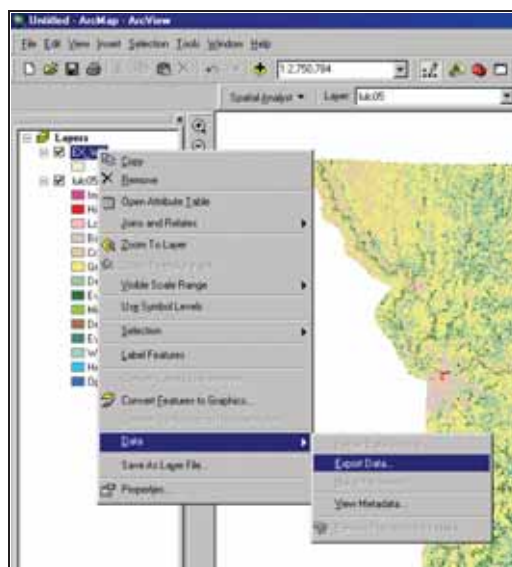


Figure 2-2

- b. In the Export Data menu, change the 'Use same coordinate system as:' from the layer's data source to 'the data frame' (1). Click the browse folder (2) to designate a desired location (Here you will also name your new shapefile). Once you have browsed to the location where you want to store your new shapefile and renamed it, click Save. Click OK to continue. (Figure 2-3)

*If a prompt appears asking if you want to add the data as a layer, choose yes.

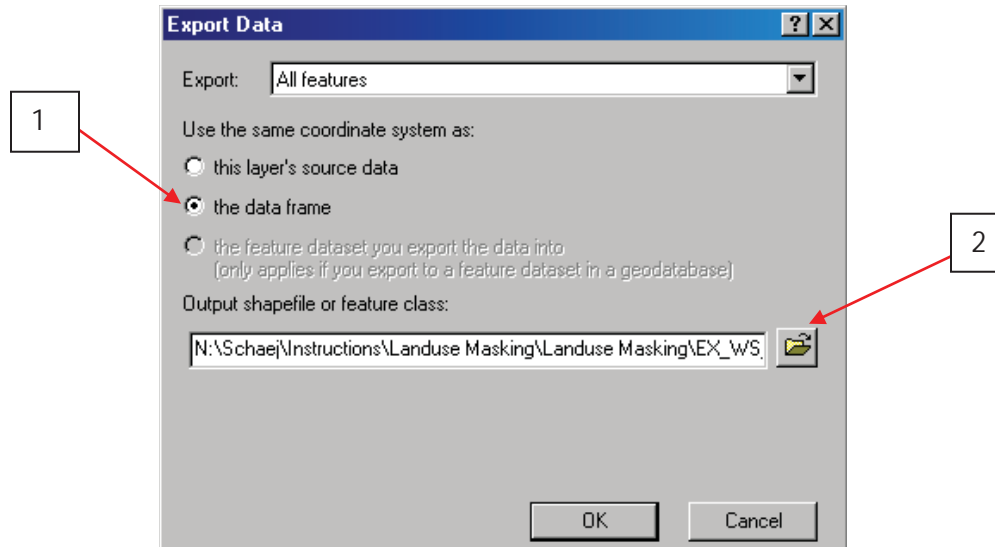


Figure 2-3

- c. Right click the original watershed file in the table of contents and click Remove to remove it from the table of contents. (Figure 2-4)

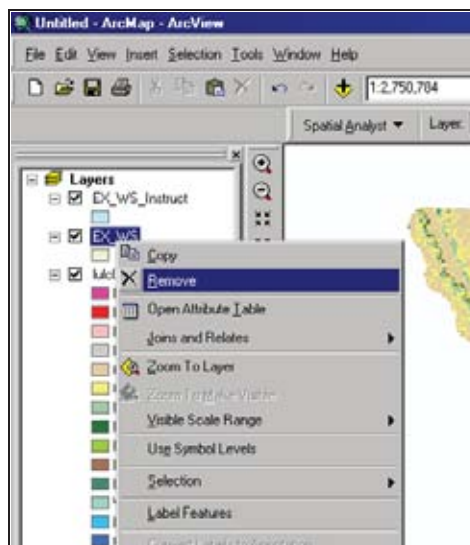


Figure 2-4

3. With the lulc05 file and your watershed now in the same coordinate system, the Spatial Analyst tool will be added and used to proceed.
 - a. Right click the grey area near the top of ArcMap and scroll down and select the 'Spatial Analyst' Toolbar (Figure 3-1)

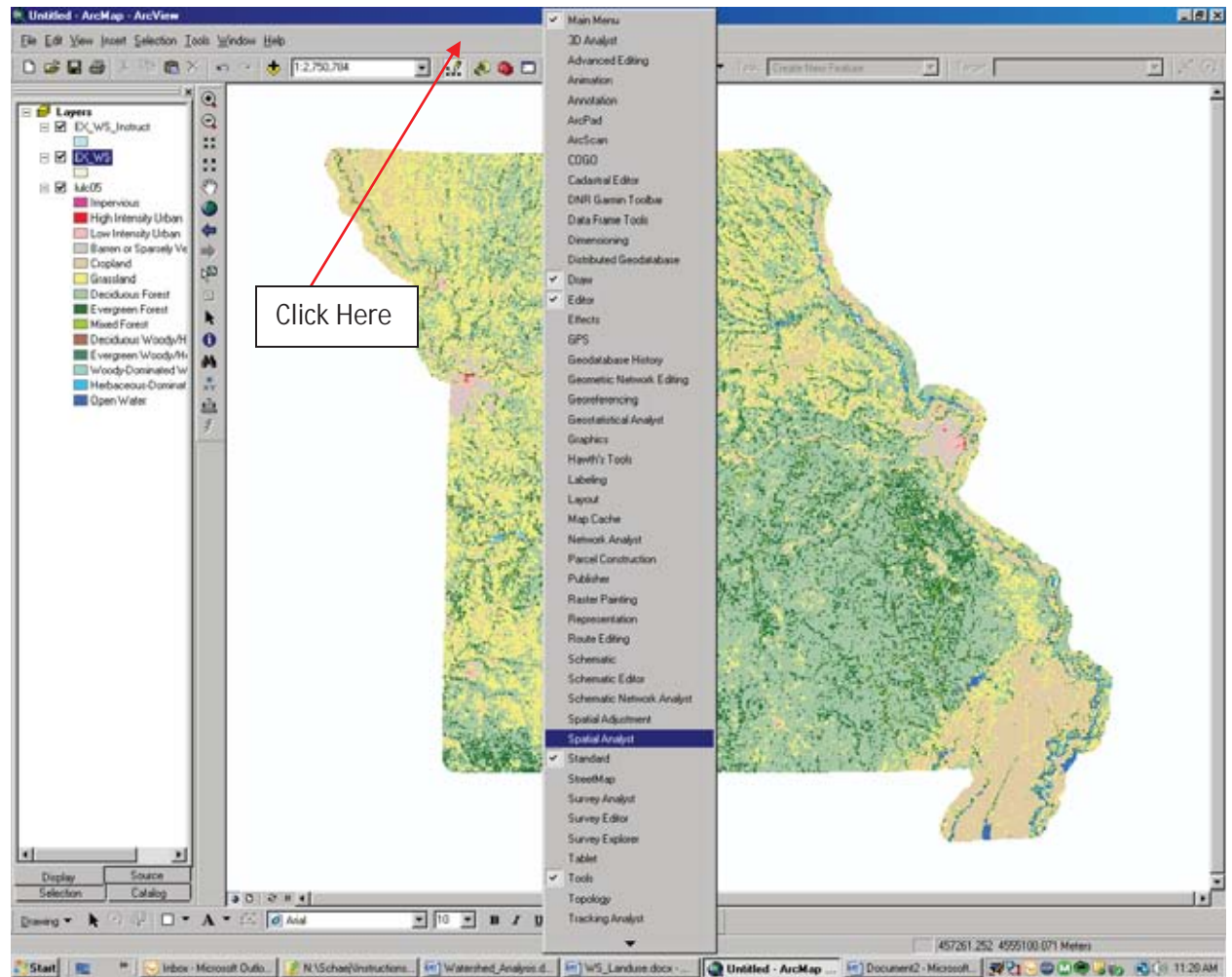


Figure 3-1

*Drag the Spatial Analyst Toolbar to a desired location in ArcMap.

- b. Before proceeding, we will ensure that the Spatial Analyst extension is turned on. In the ArcMap main menu, select Tools > Extensions (Figure 3-2) and make sure the checkbox next to Spatial Analyst is selected. Click Close when all appropriate changes are made.



Figure 3-2

4. With the Spatial Analyst toolbar now added, click the Spatial Analyst dropdown menu and select Options (Figure 4-1)

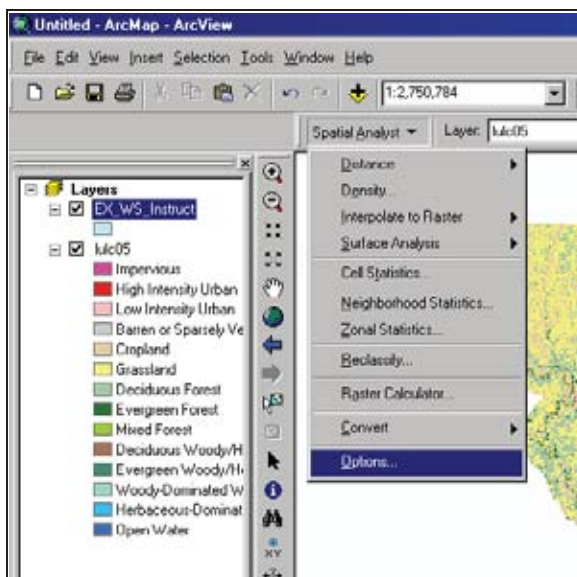


Figure 4-1

- a. Under the General Tab of the Options menu, change the Analysis mask to the shapefile of the watershed. Keep the Working directory at the defaulted folder (or select C:\Temp). Select OK (Figure 4-2).

Note that the working directory stores files in relation with the analysis mask, and deleting these files may have negative consequences on any given project.

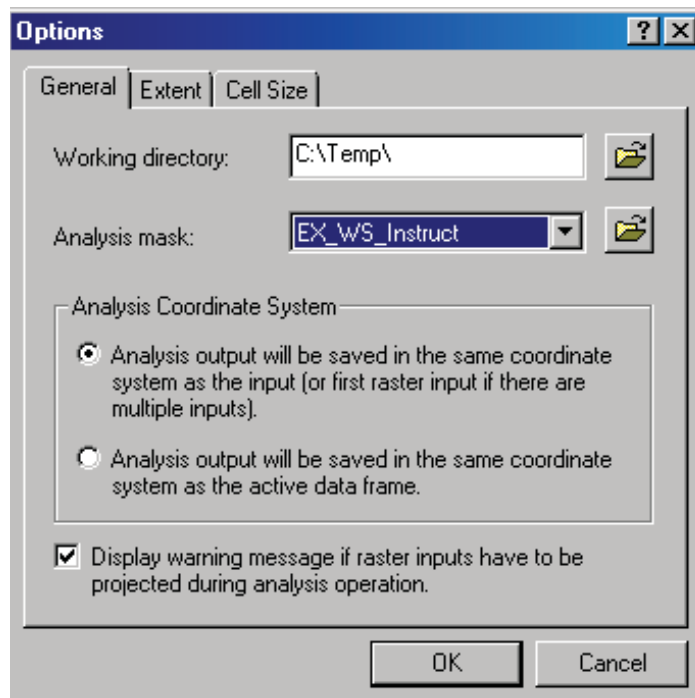


Figure 4-2

- b. Again, go to the Spatial Analyst toolbar's dropdown menu and select Raster Calculator (Figure 4-3).

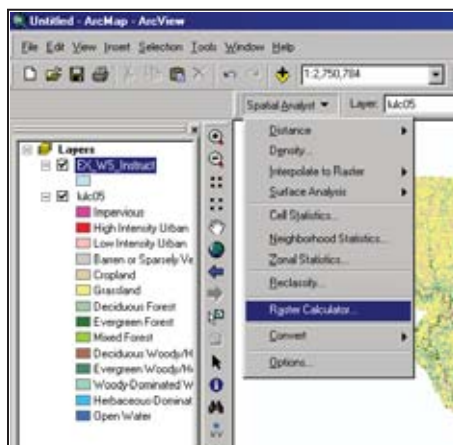


Figure 4-3

- c. Double click lulc05 so that it appears in the expression box and select Evaluate (Figure 4-4)

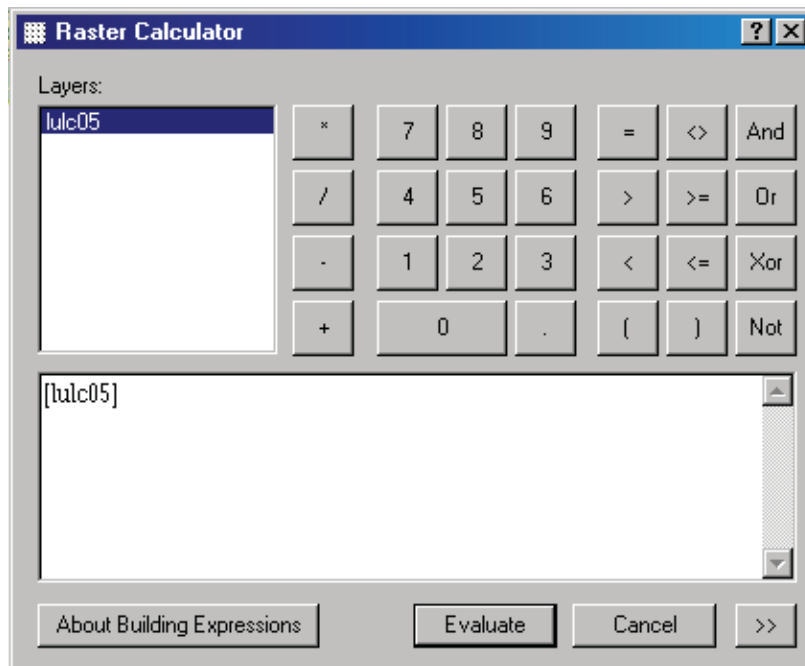


Figure 4-4

5. Now, right-click the Calculation file in the table of contents and select Data > Make Permanent. (Figure 5-1)

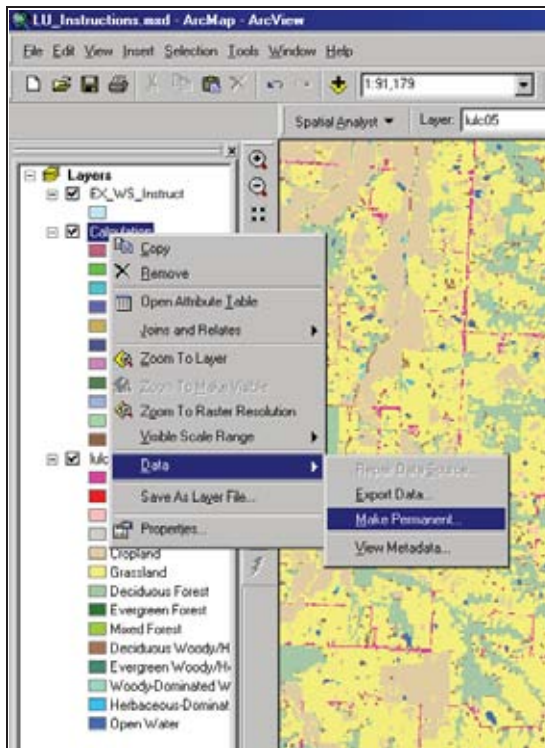


Figure 5-1

- In the Make Calculation Permanent menu, navigate to a desired location, name the file and select Save. (Be sure to its name is no more than 13 characters with no spaces)
- With the Calculation file made permanent, uncheck the original lulc05 layer so that only the landuse within the watershed is displayed.

6. Now right-click Calculation in the table on contents and select Open Attribute Table.
 - a. Click the Options button located towards the bottom of the attribute table and select Add Field (Figure 6-1).

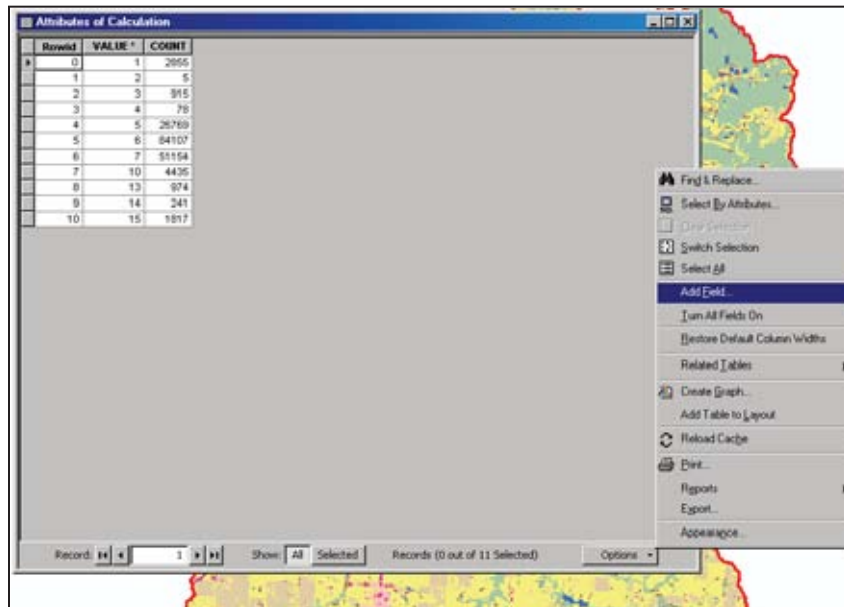


Figure 6-1

- b. Name the field Acres with the Type being 'Double' and a Precision of 12 and a Scale of 2 (Figure 6-2). Select OK.

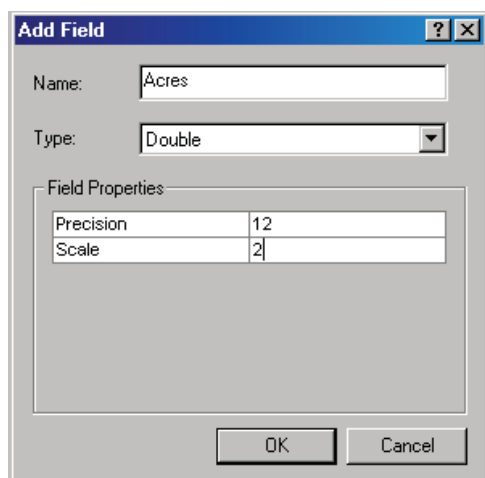


Figure 6-2

- c. Right click on the Acres field in the Attribute Table and select Field Calculator (Figure 6-3)

*If a pop-up box appears, select Yes.

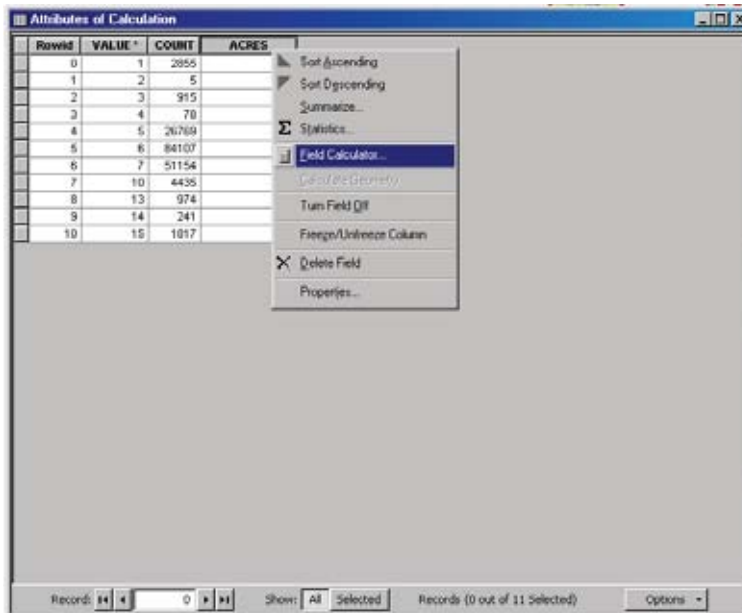


Figure 6-3

- d. In the Field Calculator menu, enter the following expression: $[(\text{COUNT}) * 900) * 0.000247]$ (Figure 6-4). This will calculate the acres associated with each given land-use type. Select OK.

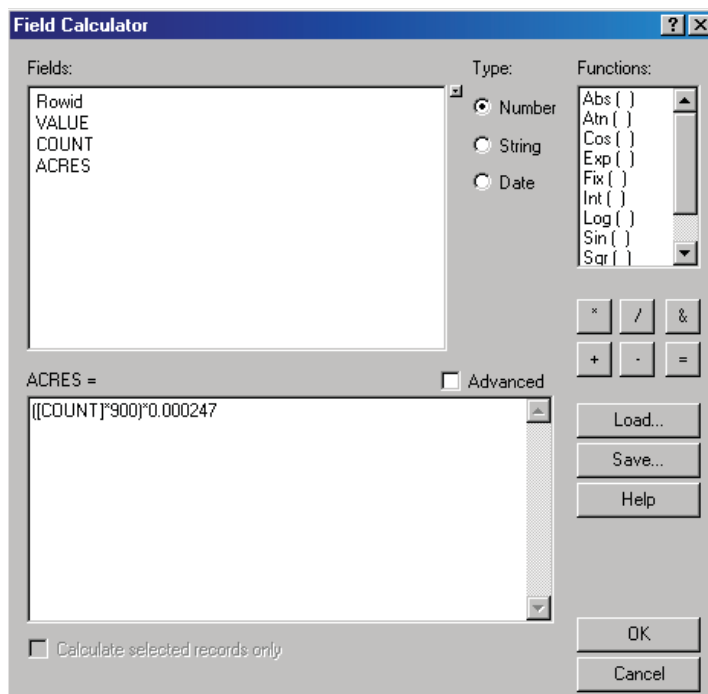


Figure 6-4

7. Again, click the Options tab in the Attribute Table and select Add Field.
- a. Name the field Percent with the Type being 'Double' and a Precision of 2 and a Scale of 0 (Figure 7-1). Select OK.

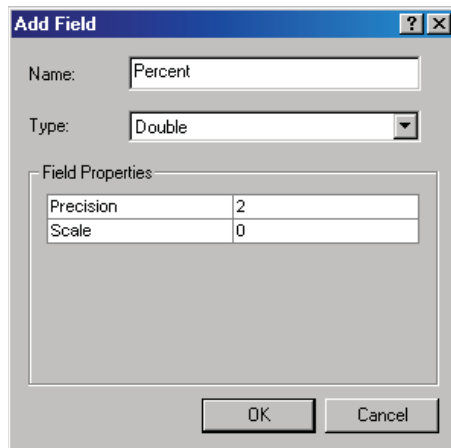


Figure 7-1

- b. Right click the Acres field in the Attribute table and select Statistics. Find 'sum' (In this example: 38535.7) and write that number down for later use.
- c. Right click the Percent field and choose Field Calculator (Click yes if a pop-up appears) In the Field Calculator box, enter the following expression: $[(\text{ACRES}) / \text{number from step 7b}) * 100$ (Figure 7-2) Select OK and close the attribute table.

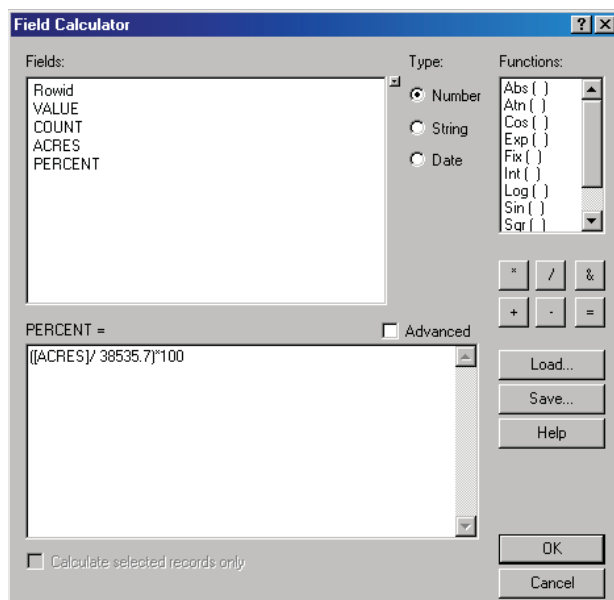


Figure 7-2

8. Now, add the LULCtbl.dbf and join it to your calculation file.
 - a. Using the Add Data tool, add the LULCtbl.dbf file. (XHD:\GIS\Statewide Server Data\Region\Landcov)
 - b. After adding the .dbf file, click the Display tab near the bottom of the Table of Contents to navigate away from the Source tab.
 - c. In the ArcMap Table of contents (In the Display tab), right click the calculation file and choose Joins and Relates > Join (Figure 8-1).

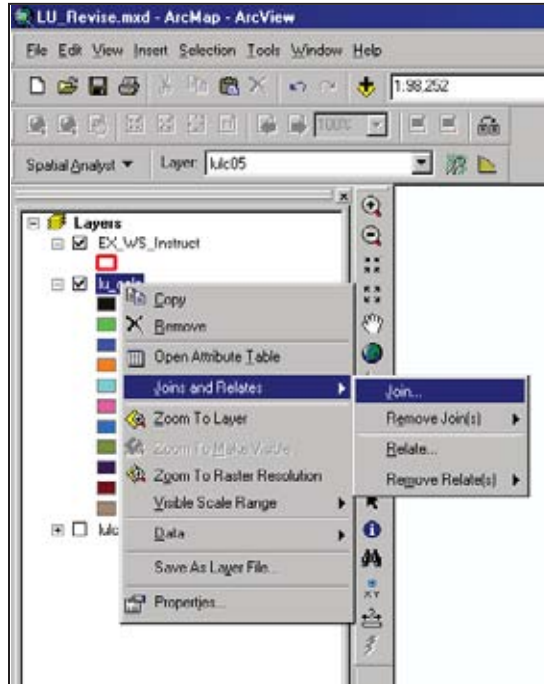


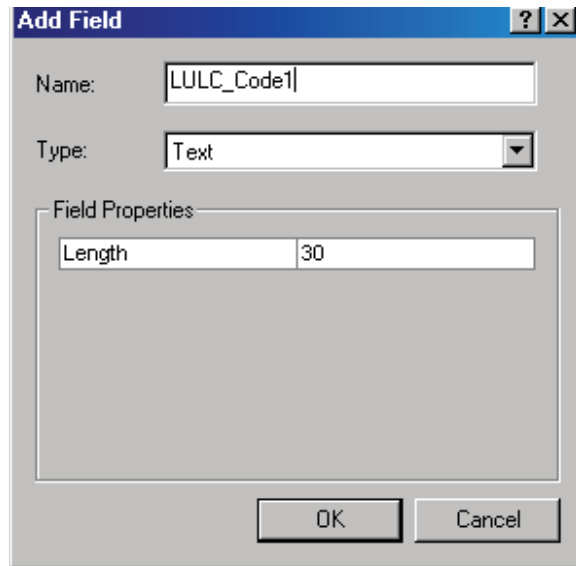
Figure 8-1

For Field 1. Choose: VALUE, for Field 2. Choose: LULCtbl, for Field 3. Choose: Value. Select OK when all fields are correctly entered.

- d. With your calculation file now joined with your LUCL table, right click the calculation file in the table of contents and open the attribute table.

- e. In the Attribute Table (which is now joined), click the Options tab and select Add Field...

Name the field: LULC_Code1, with the Type being Text, and a Length of 30 (Figure 8-2). Select OK.



The screenshot shows a standard Windows-style dialog box titled "Add Field". It has a blue title bar with a question mark icon and a close button (X). The dialog contains the following elements:

- Name:** A text input field containing the text "LULC_Code1".
- Type:** A dropdown menu currently displaying "Text".
- Field Properties:** A section containing a "Length" input field with the value "30".
- Buttons:** "OK" and "Cancel" buttons at the bottom right.

Figure 8-2

- f. Now scroll to the newly created field in the Attribute Table (it should be listed as: [your calculation file].vat:LULC_Code1.

Right-click it's title in the Attribute Table and select Field Calculator (Figure 8-3).

*If a prompt appears, choose Yes.

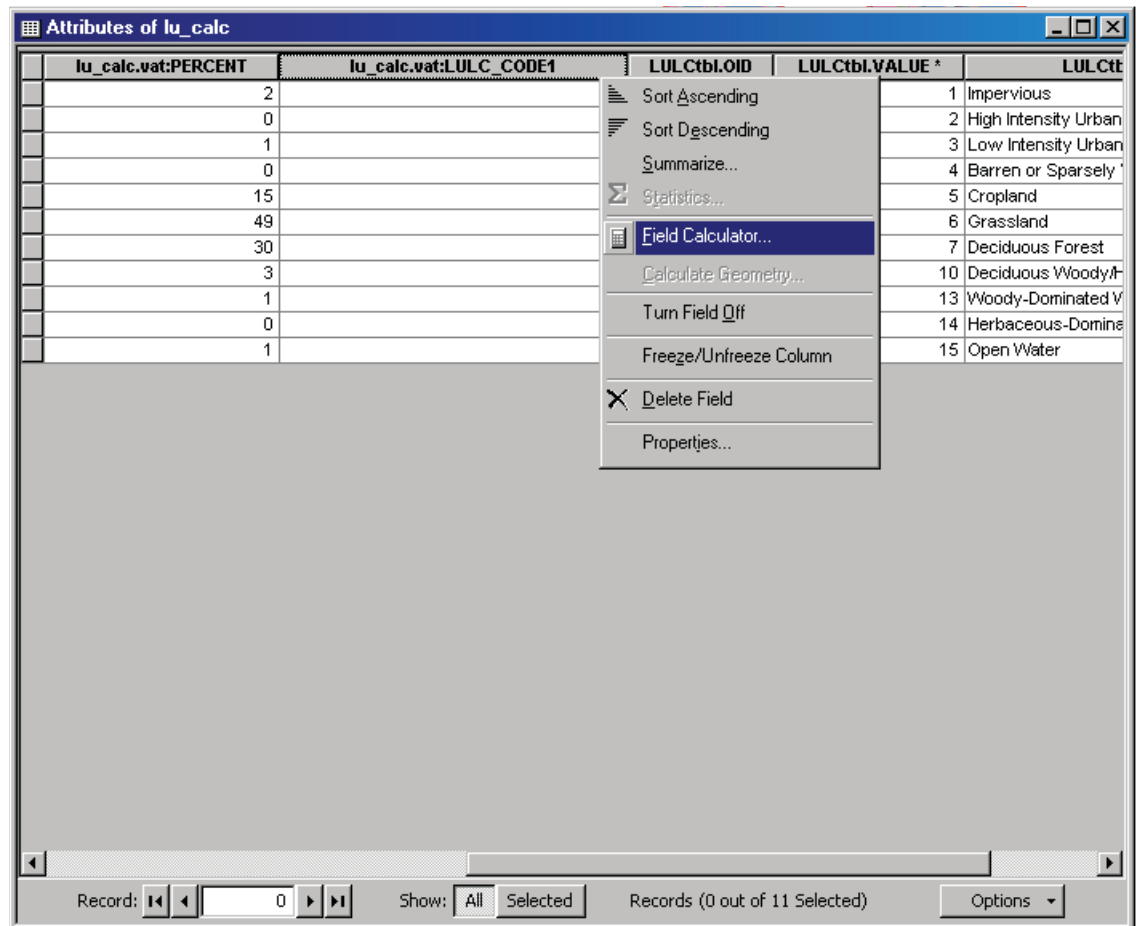


Figure 8-3

- g. In the Field Calculator box, double-click LULCtbl.Code in the Fields box to add it to the lower white box (Figure 8-4). Press OK.

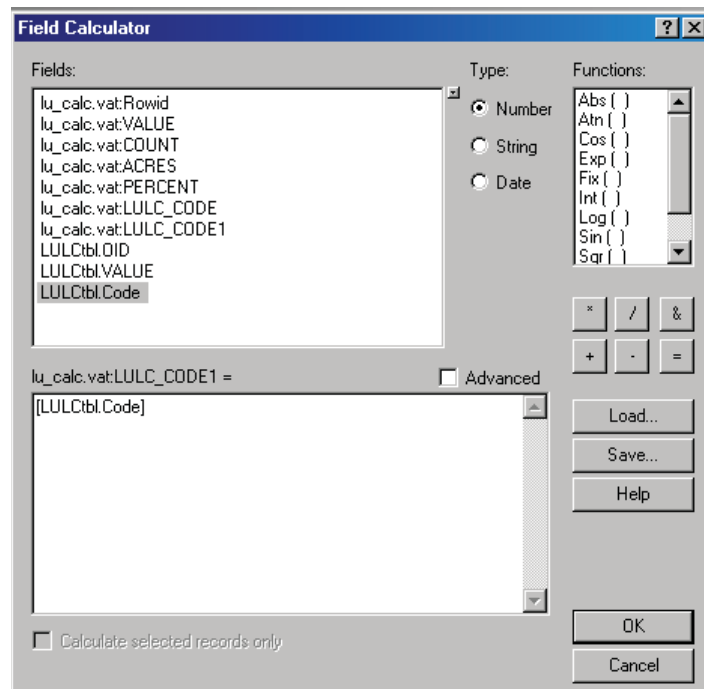


Figure 8-4

- h. With the new field now generated, the join that was created in Step 8.b can be removed. Right click the calculation file in the Table of Contents and select Joins and Relates> Remove Join(s) > Remove all Joins.
9. Now if you open the Calculation Attribute Table, you will see that LULC_Code1 has been added as a field.
- a. Symbology can be imported to the calculation file to help the user better understand the land use/land cover. Right-click the calculation file in the Table of Contents and select Properties.

- b. In the Layer Properties box, select the Symbology tab (1) and then select the Import button (2) (Figure 9-1).

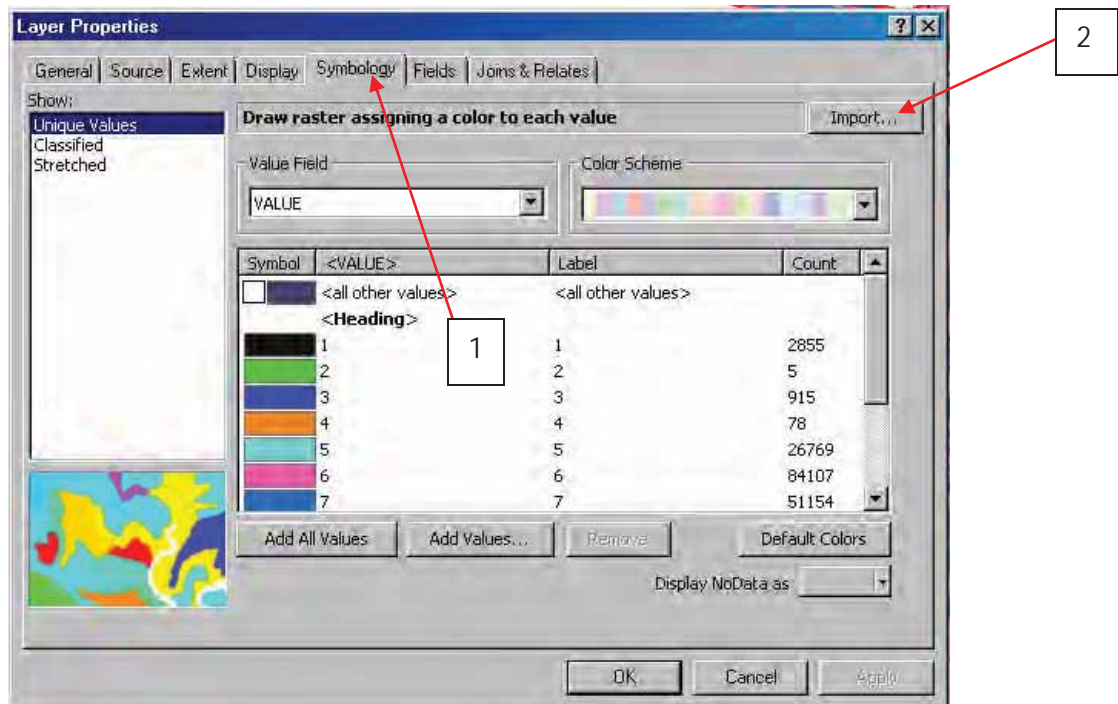


Figure 9-1

- c. In the Import Symbology box, select lulc05 and select OK. *If it does not appear in the dropdown box, click the browse button to navigate to its location.

- d. Now, before closing out of the Layer Properties box (Symbology tab) scroll down the Count Field and locate all that contain a 0 (Figure 9-2).

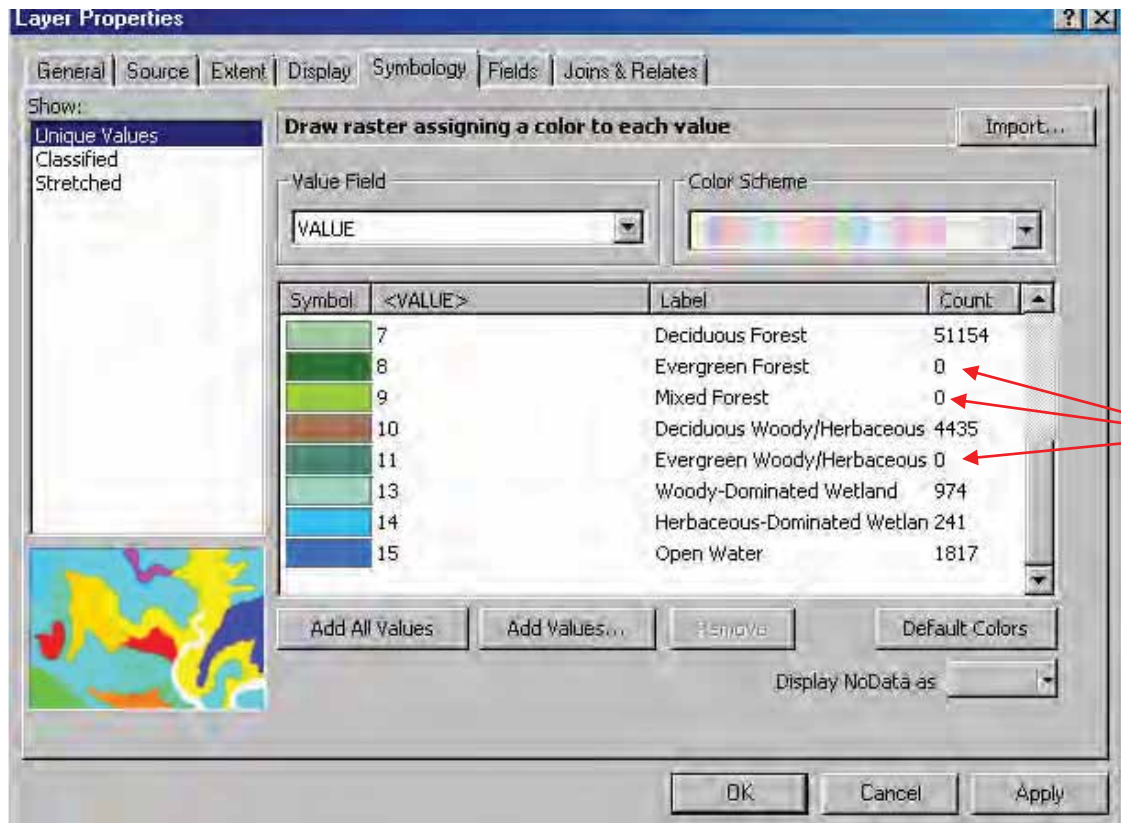


Figure 9-2

-Right click these values in the box and select 'Remove Values' (Figure 9-3). (This will help later when creating a legend in Layout View.) *Remove all Counts of 0. Click Apply, then OK.

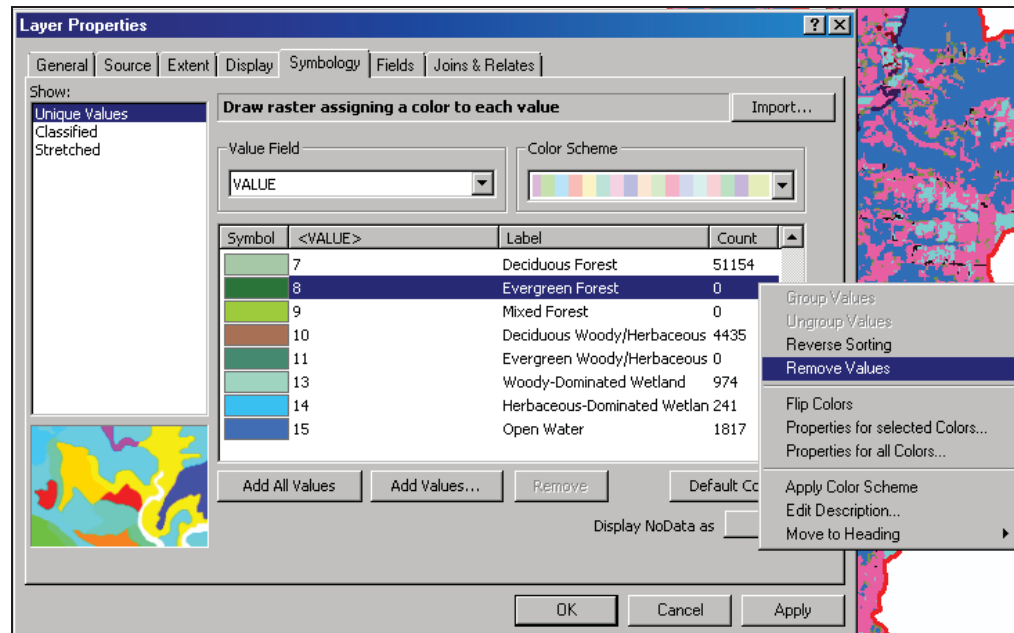
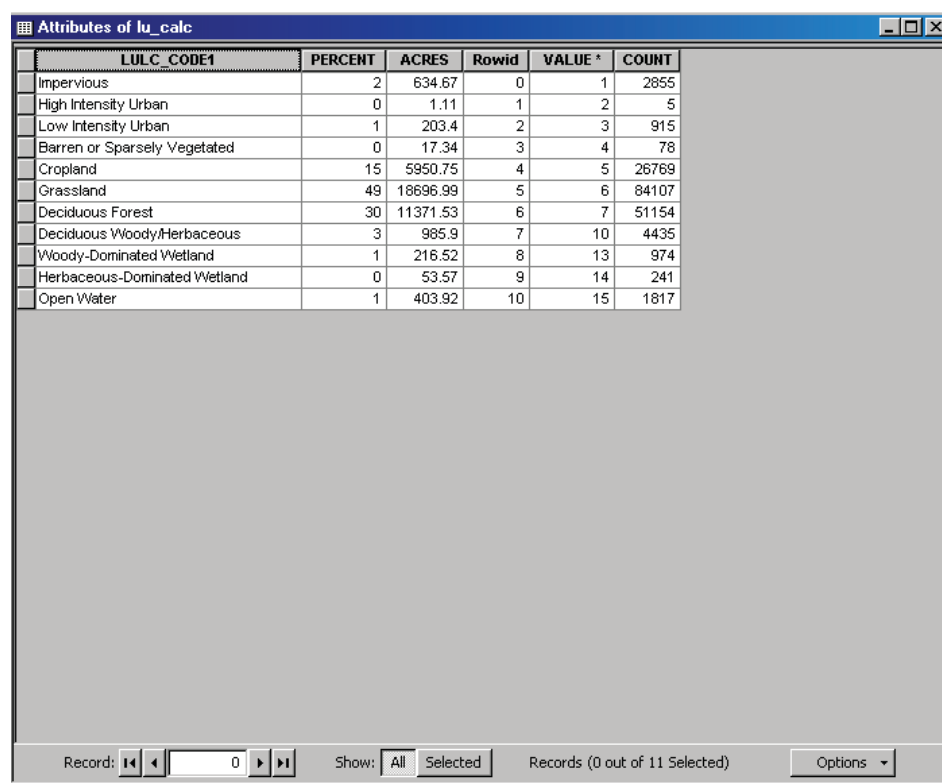


Figure 9-3

10. You can now work on bringing a table representing the attributes of the calculation file into the Layout View.

- a. Right click the calculation file in the Table of Contents and open the Attribute Table. In the attribute table, click the headings of fields once to select them, and click again and hold and drag the field to the desired order. Use (Figure 10-1) for example.
- b. *Note how LULC_CODE1, PERCENT, and ACRES are now aligned to the left of Rowid, VALUE *, and COUNT.



LULC_CODE1	PERCENT	ACRES	Rowid	VALUE *	COUNT
Impervious	2	634.67	0	1	2855
High Intensity Urban	0	1.11	1	2	5
Low Intensity Urban	1	203.4	2	3	915
Barren or Sparsely Vegetated	0	17.34	3	4	78
Cropland	15	5950.75	4	5	26769
Grassland	49	18696.99	5	6	84107
Deciduous Forest	30	11371.53	6	7	51154
Deciduous Woody/Herbaceous	3	985.9	7	10	4435
Woody-Dominated Wetland	1	216.52	8	13	974
Herbaceous-Dominated Wetland	0	53.57	9	14	241
Open Water	1	403.92	10	15	1817

Figure 10-1

- c. Now, Right click the Rowid field and select 'Turn Field Off'. Do this to the VALUE * field as well as the COUNT field.

- d. With your table appearing as it does in (Figure 10-2), click Options in the Attribute Table and select Add Table to Layout.

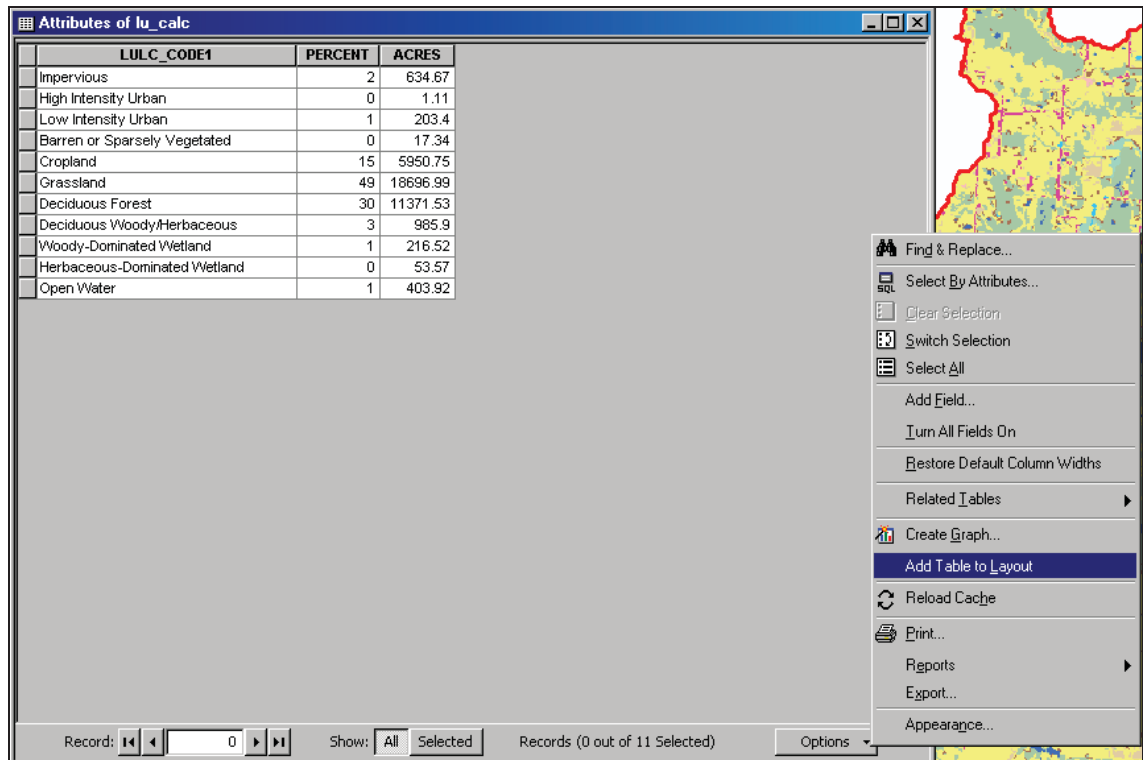


Figure 10-2

- e. You now have a table in the Layout View of ArcMap. Click and drag it's edges to adjust its size and visible fields.

11. The last step to this exercise is adding a legend to see what colors correspond with which land use/land cover type.
- In the ArcMap main menu, select Insert, then Legend. In the Legend Wizard, make sure that the only Legend Item showing on the right-hand side is your calculation file. (Click the arrow buttons [>, >>, <, <<] to add or remove items) (Figure 11-1).

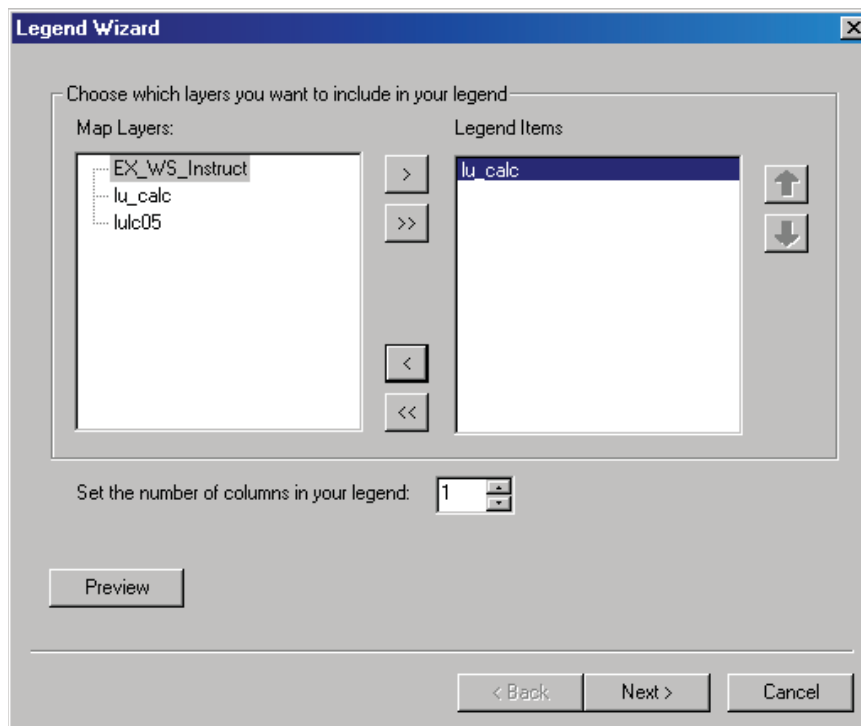


Figure 11-1

- The next four screens in the Legend Wizard display changes that can be made to your legend. Click Next > through them all and select Finish to add the legend to the Layout View.
- The legend, once in the Layout View, can be moved and re-sized (Figure 11-2).

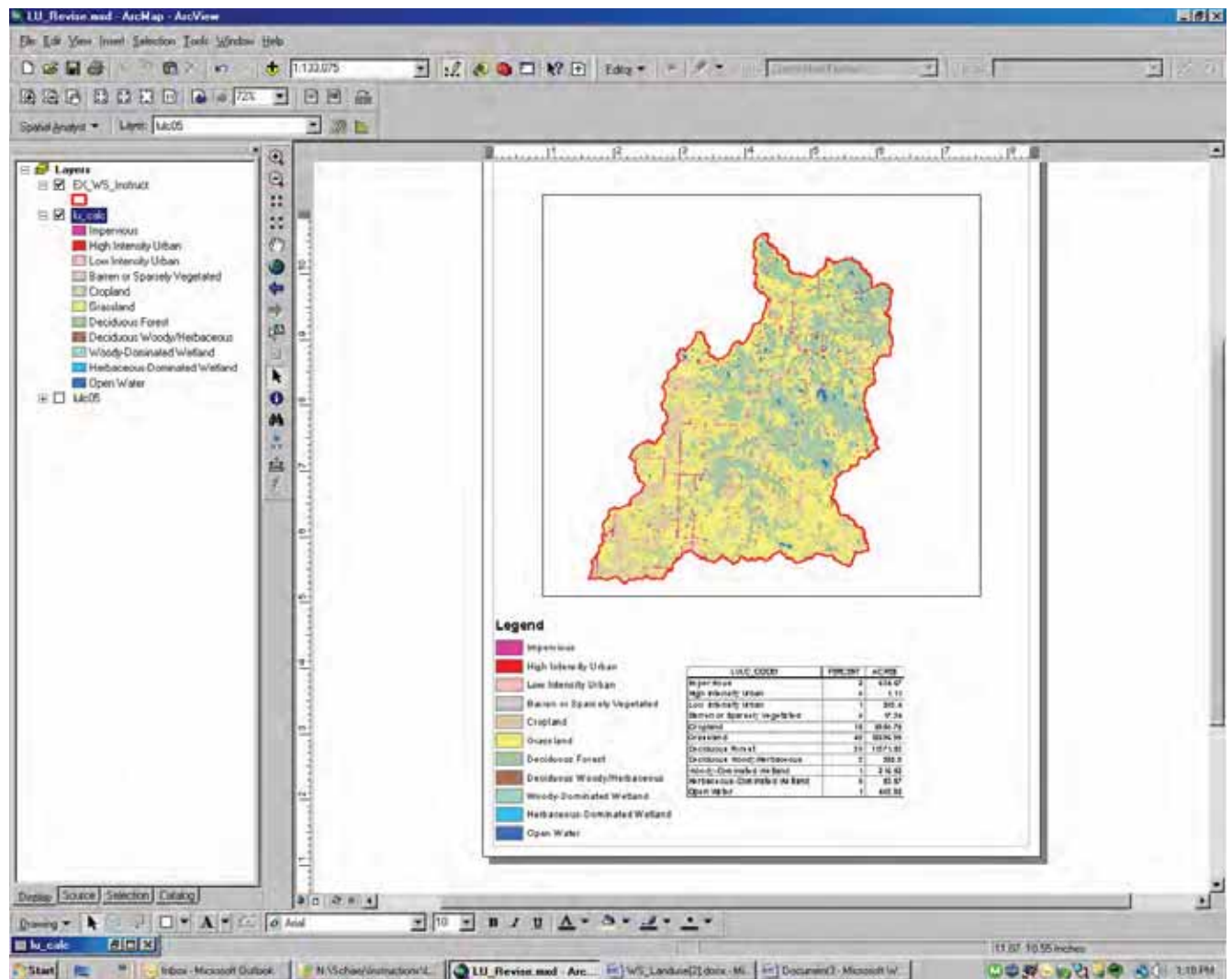


Figure 11-2

- d. You can use the Insert drop-down to add more components to your map (Like North Arrow, Title, etc.)

Guide Sheet 3: Human Threat Index Data

(Locating and identifying the potential human threats within the watershed)

Displaying Human Threat Data Instructions

1. Using the Calculation, example watershed, and lulc05.lyr files (1) from the 'Determining Watershed Landuse Percentages' Guide-sheet 2, add Human Threat Data to the map.
 - a. Using the Data Structure Layout and the Add Data Tool (2), add any desired Human Threat Data to ArcMap. (XHD:\GIS\MORAP HTD) (Figure 1-1)

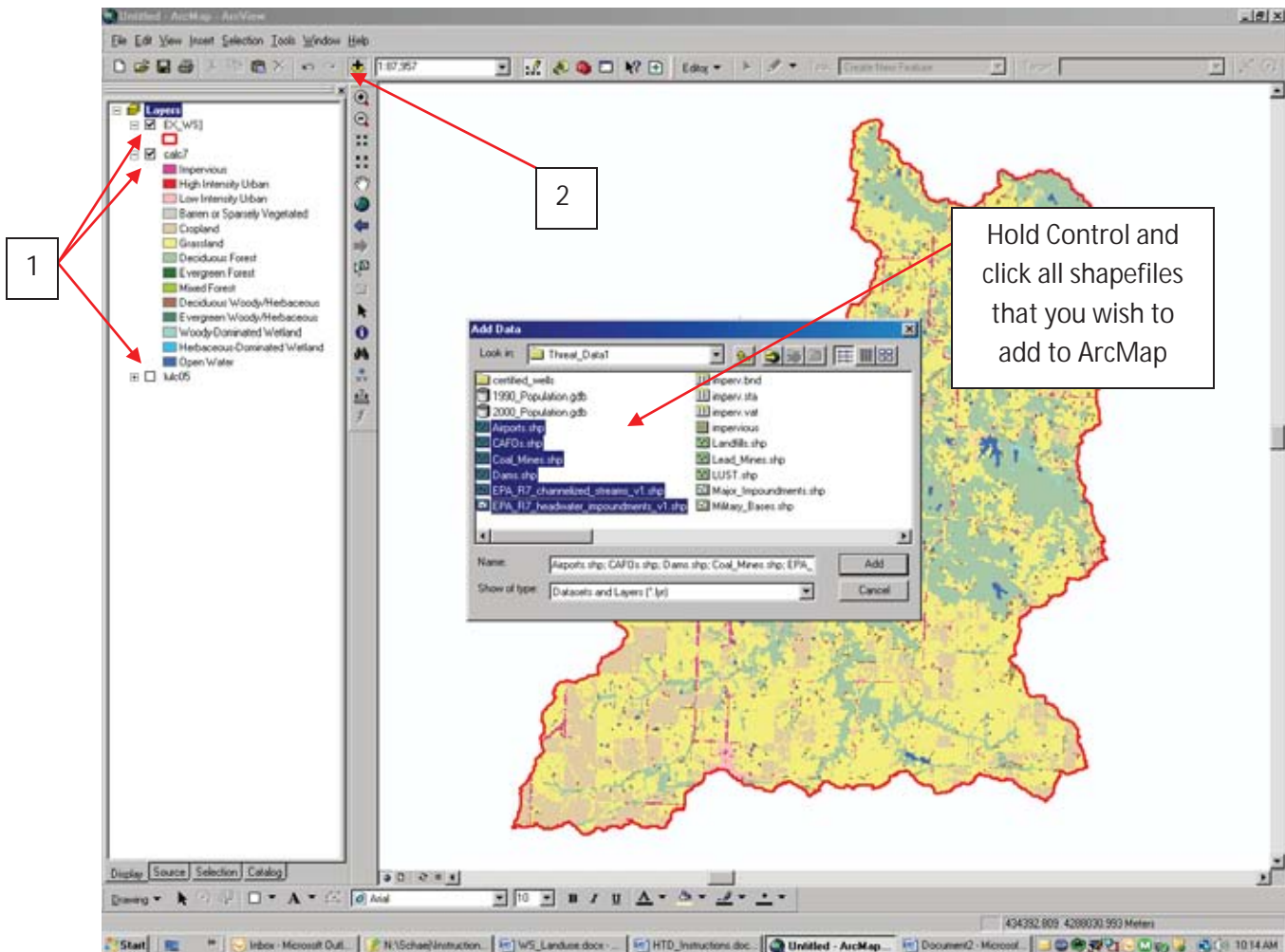


Figure 1-1

2. With all of the desired HTD added, your layout should appear as it does in Figure 2-1.

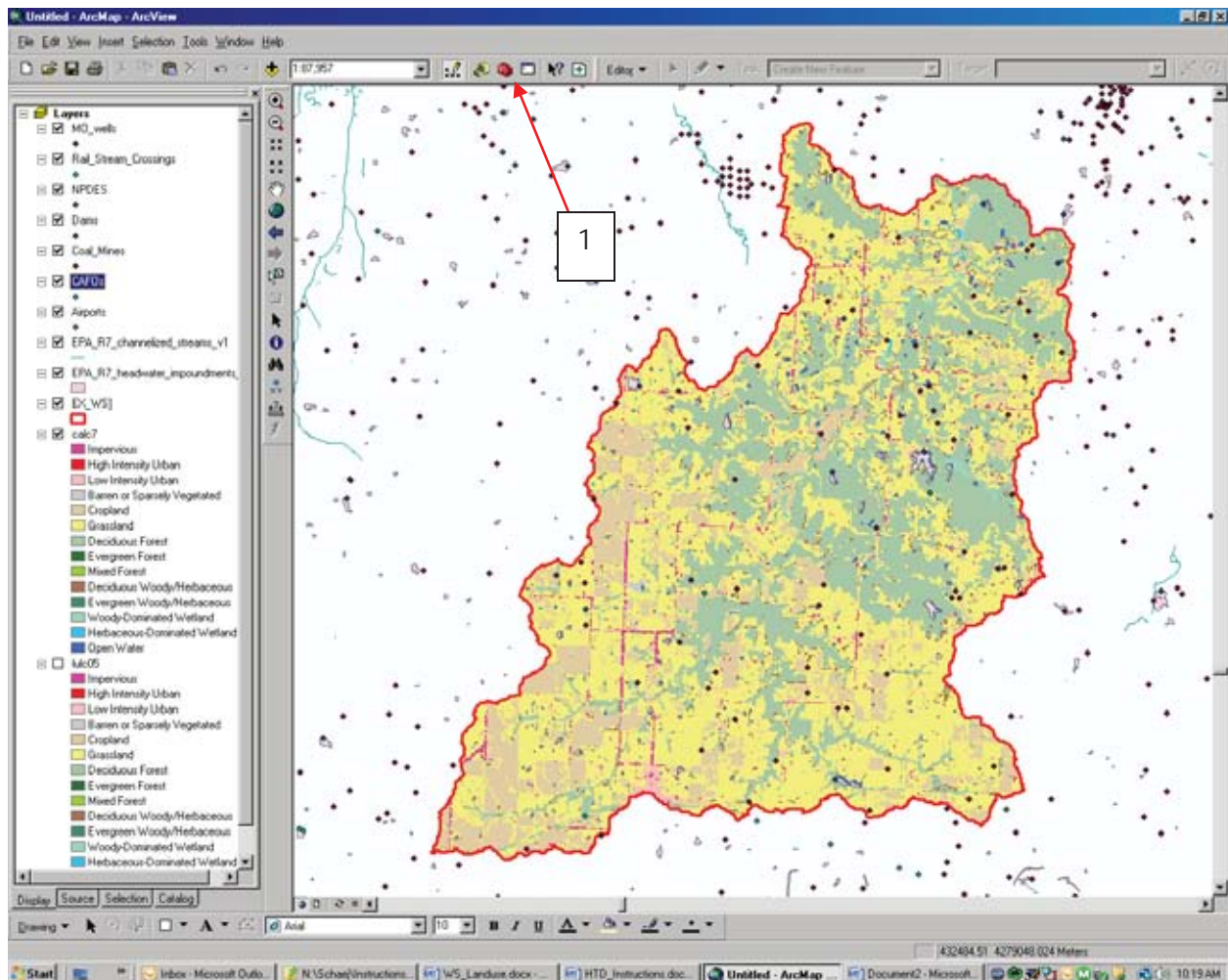


Figure 2-1

- a. Click the ArcToolbox Icon to expand the Toolbox. (1) (Figure 2-1)
- b. In the ArcToolbox, click [Analysis Tools > Extract > Clip]. In the Clip menu, select a HTD for 'Input Features' to clip within the watershed in order that only features within the example watershed remain. (The Dams shapefile will be used in this example.) Select the watershed polygon shapefile as the 'Clip Features' and use the browse button to create an output file in the 'Output Feature Class' box. (Figure 2-2)

Name the output something along the lines of the shapefile that is being clipped (i.e. CF_dams)

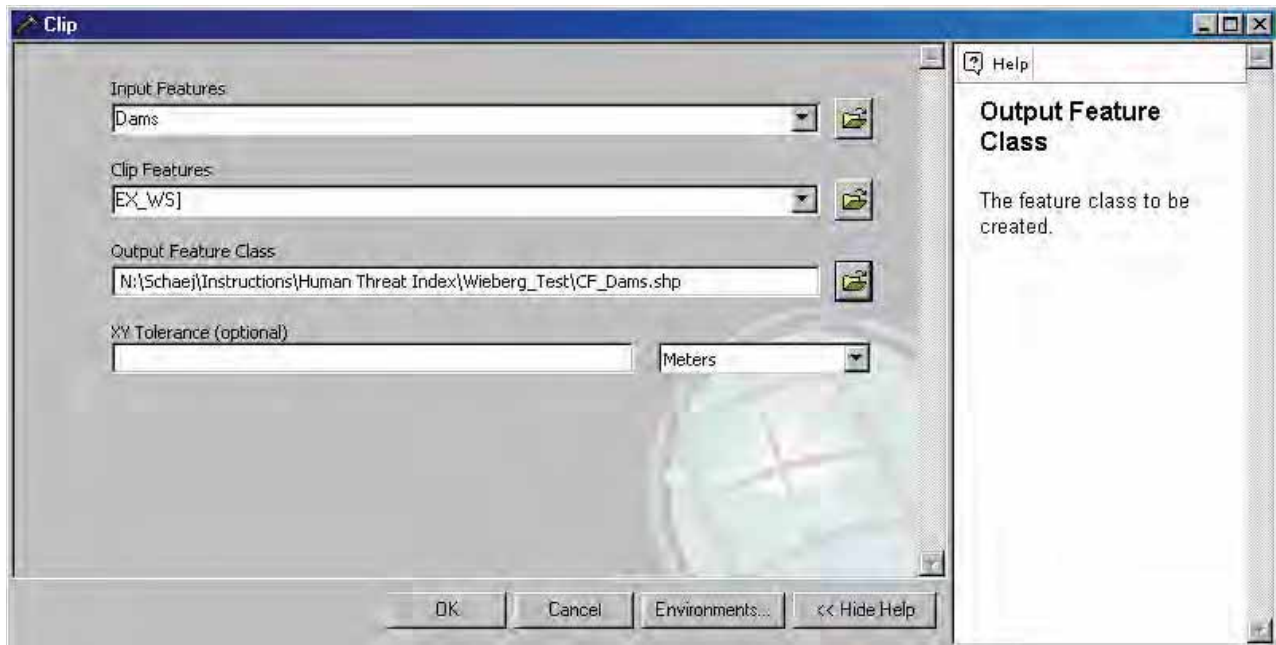
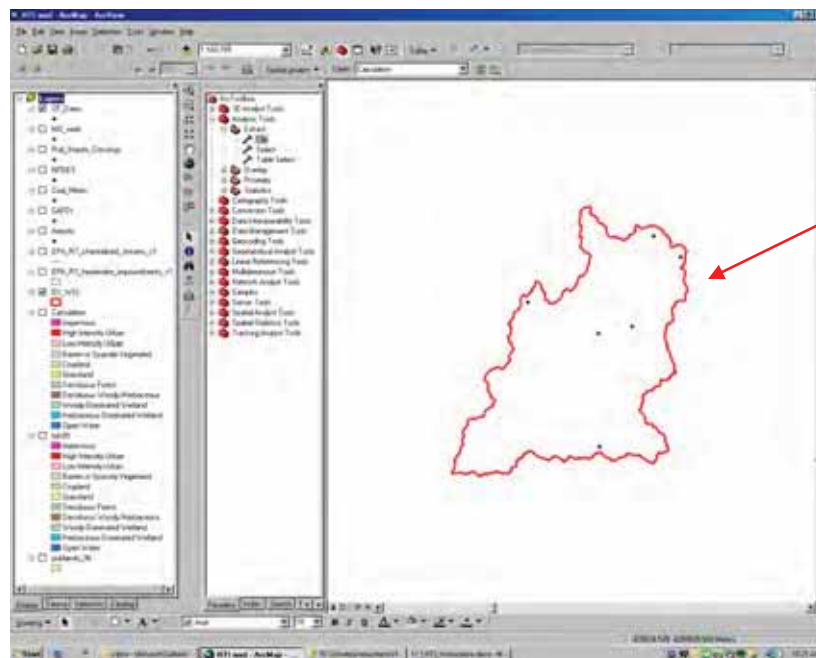


Figure 2-2

- c. The newly created shapefile will automatically be added to the ArcMap table of contents after the clipping process is completed. Uncheck and remove the original dams shapefile and ensure that the new shapefile (CF_dams) displays features only present in the watershed outline. (Figure 2-3)



Note that no features remain outside of the watershed outline.

Figure 2-3

- d. Repeat steps 2b to 2c on all remaining HTD data so that only features within the watershed remain.
3. Notice that the names of the titles in the table of contents have changed. Right click a Human Threat Data layer in the table of contents and select Properties to open its Layer Properties box. (Figure 3-2) In the Layer Properties box you can change the name of the layer under the General tab.

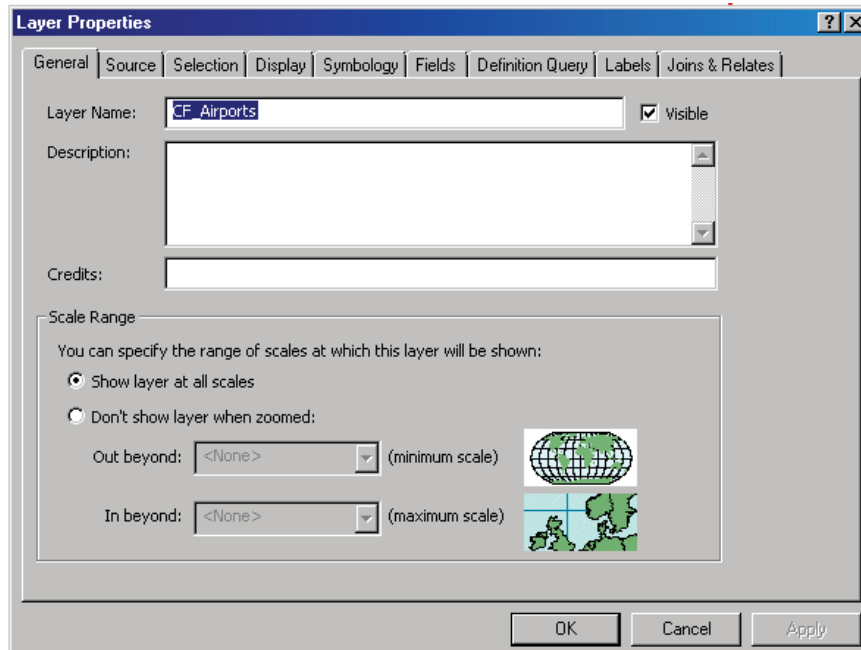


Figure 3-2

- a. Again, in the ArcMap table of contents, select the symbol (1) located below the titles of the Human Threat Data layers to open its Symbol Selector menu. (Figure 3-3) In the Symbol Selector menu, use the scroll bar to navigate through all of the available symbol options. Here, the symbol colors can also be changed.

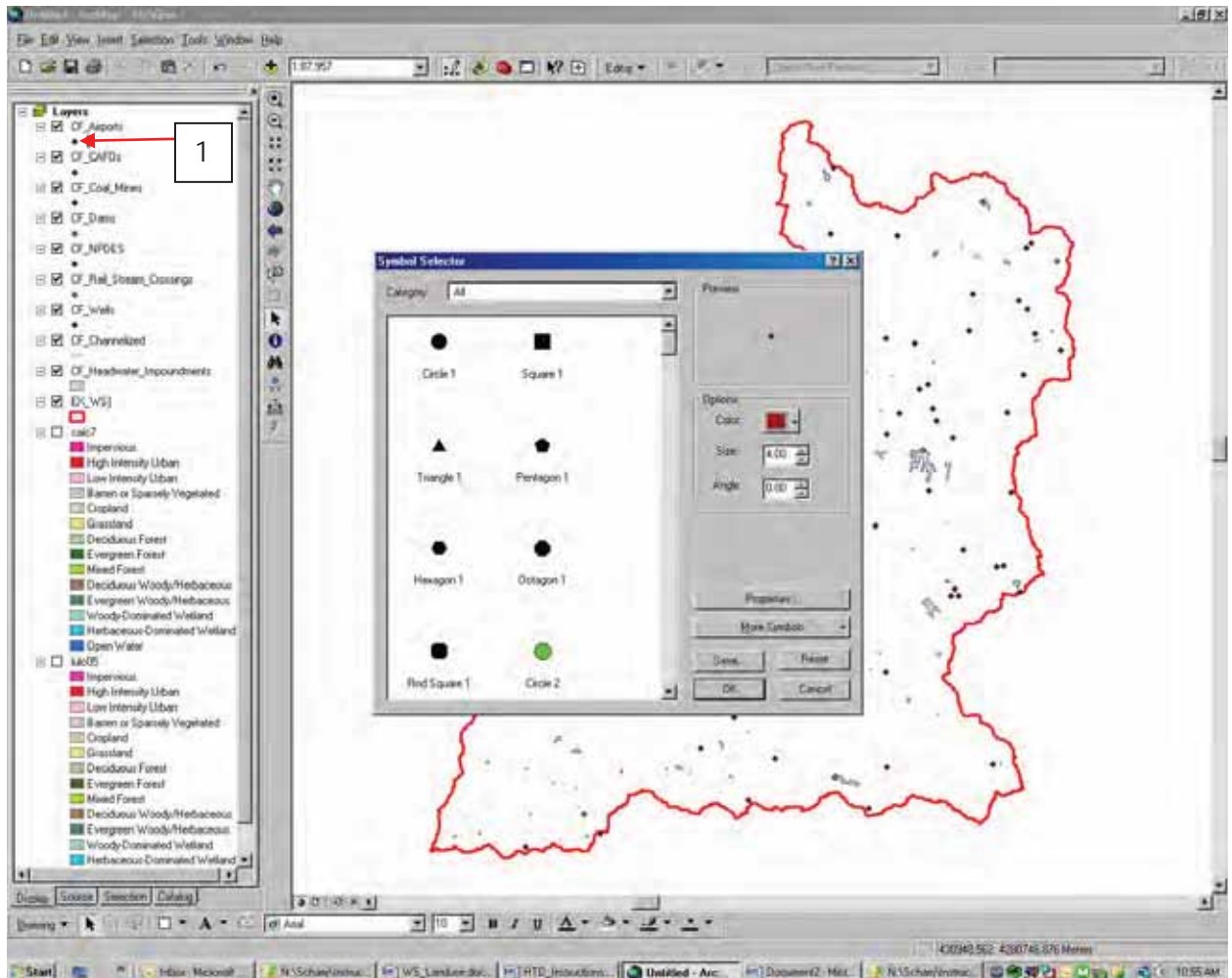


Figure 3-3

- b. Figures 3-4 and 3-5 show all of the new symbol properties.

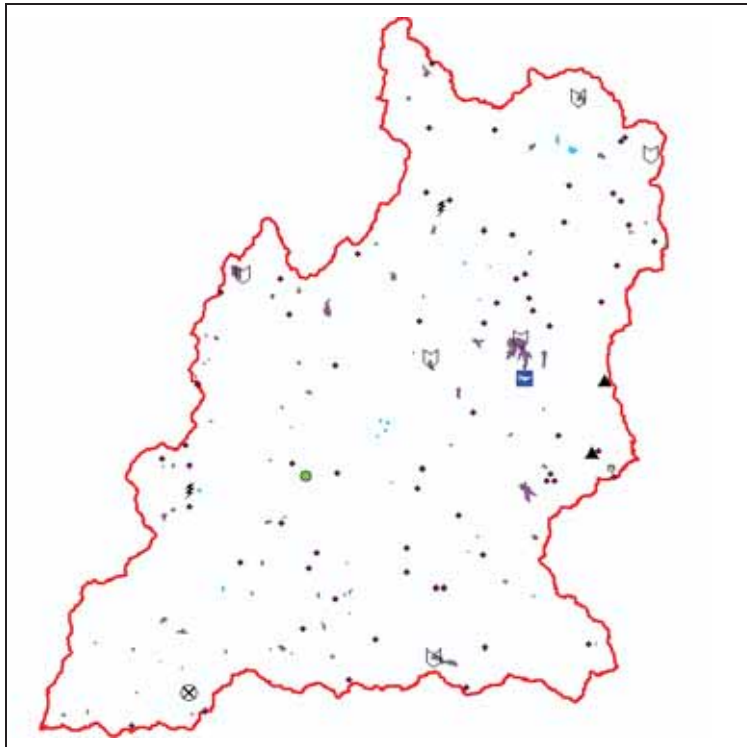


Figure 3-4

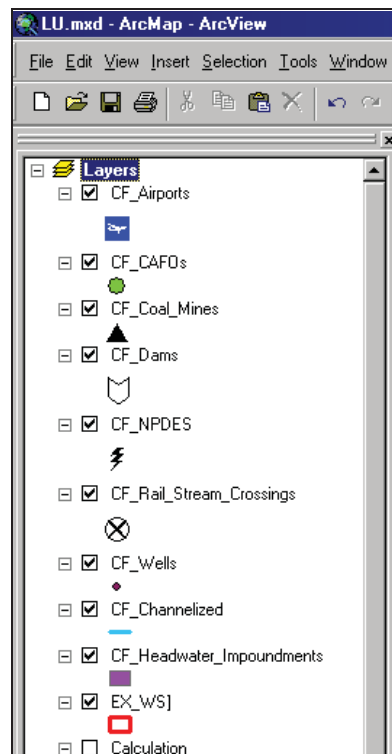


Figure 3-5

4. Similar to 'Guidesheet 2: Watershed Land-Use', use the layout view and Insert > Legend to view the finished map. Figure 4-1

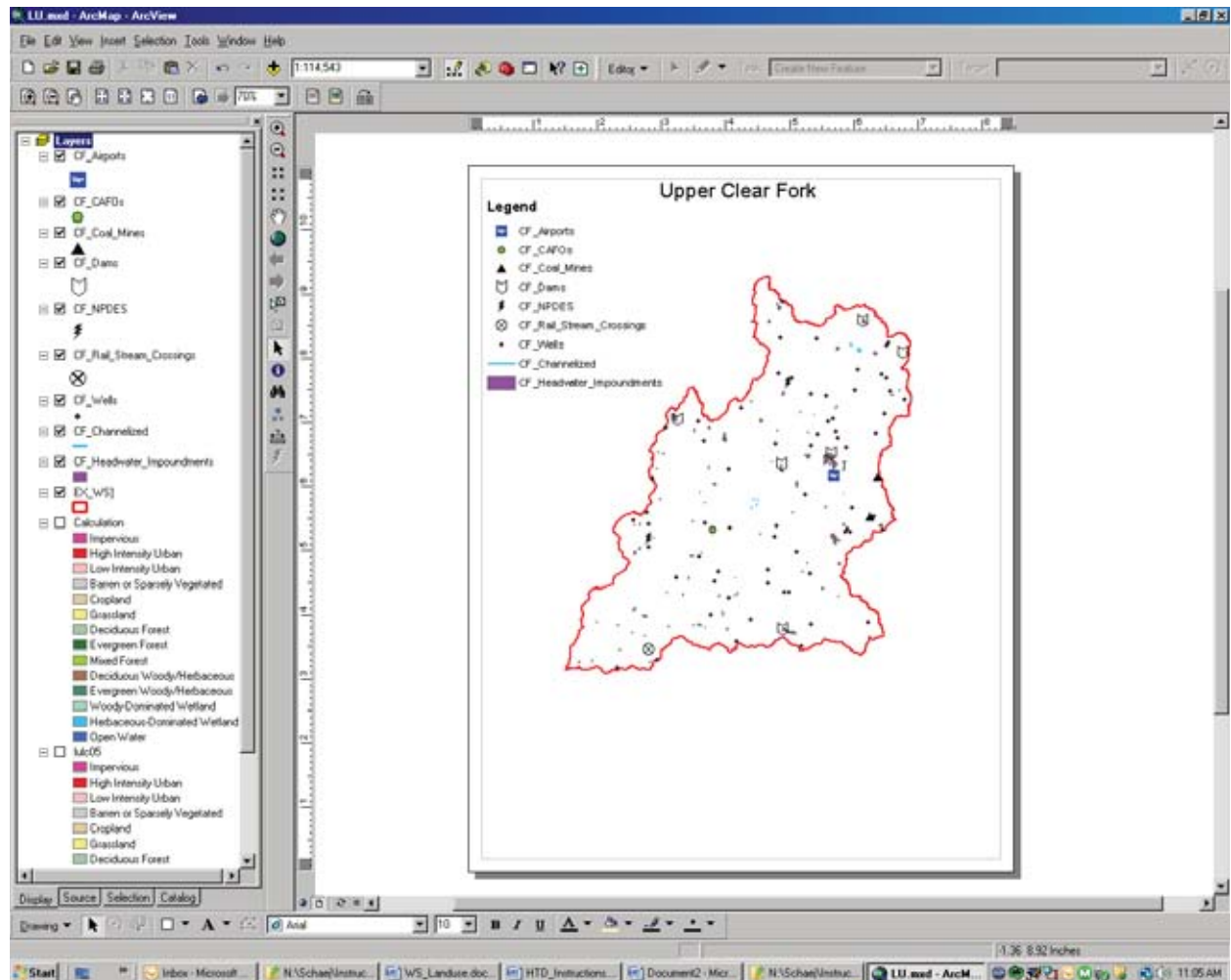


Figure 4-1

5. Adding public lands to the display could also be beneficial. Using the Data Structure Layout navigate to desired public lands and add them to ArcMap.
(XHD:\GIS\AquaticGAP\Aquatic_Data\Administrative)
 - a. Once public lands has been added, you zoom out from the watershed in Layout view to view them in this example because no public lands are present within this particular watershed. (Figure 5-1)
 - b. Check the Calculation box to turn land-cover back on. (Figure 5-1)

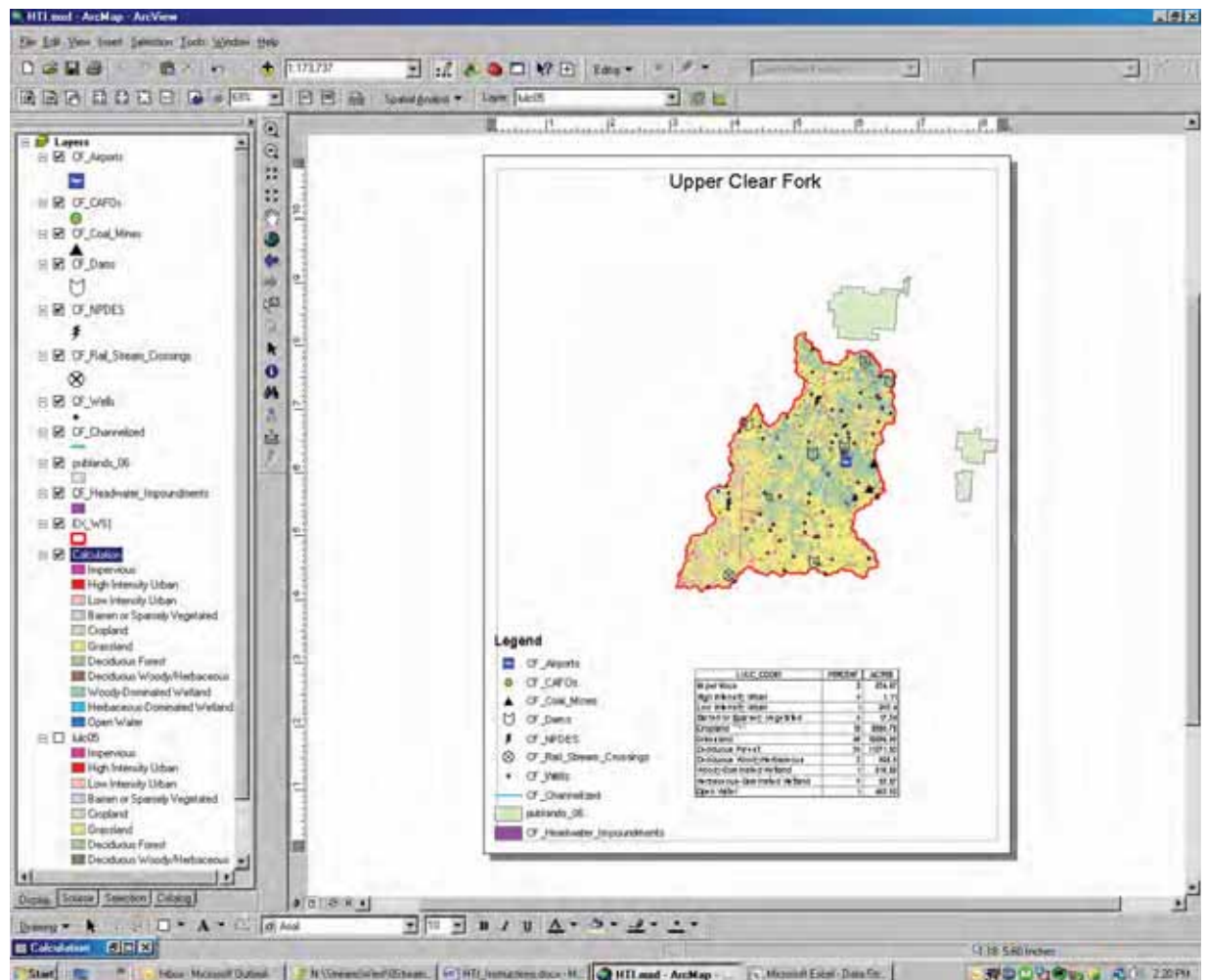



Figure 5-1

Guide Sheet 4: Creating a Windshield Tour Map

(Creating a map to crossing observation points in the watershed)

Creating a Windshield Tour Map

1. First, open your previously saved watershed delineation ArcMap project. – From Guidesheet 1
2. Un-check all layer boxes in the layer pane, except for the watershed shapefile that you created that merged all of the sub-watersheds together (ie. XriverWS).
3. Like in Step 4 of “Delineating a Watershed” instructions, we will add other data layers.
 - a. First, bring in Roads (XHD:\GIS\MORAP HTD\Administrative) and Road_Stream_Crossing (XHD:\GIS\MORAP HTD\Threat_Data1) layers using the **Add Data tool**  (The Road_Stream_Crossing layer is comprised of point features, present when a stream/river crosses a roadway. Each point has a classification number that will help with location recognition and data organization.)
 - b. Add any other desired layers that might be useful when using the map to drive the watershed. Use the Data Structure Layout to see the files that are available. However, fewer layers will make the final, printed map easier to read. Proceed to modify the layers’ appearances to fit your needs. You will then be ready to move on to the ArcMap Layout View for further enhancement.

In the bottom left-hand corner of your screen, you will see what appears to be both a globe and folded sheet of paper. Click the paper image; this is the layout view (Figure 3-1).

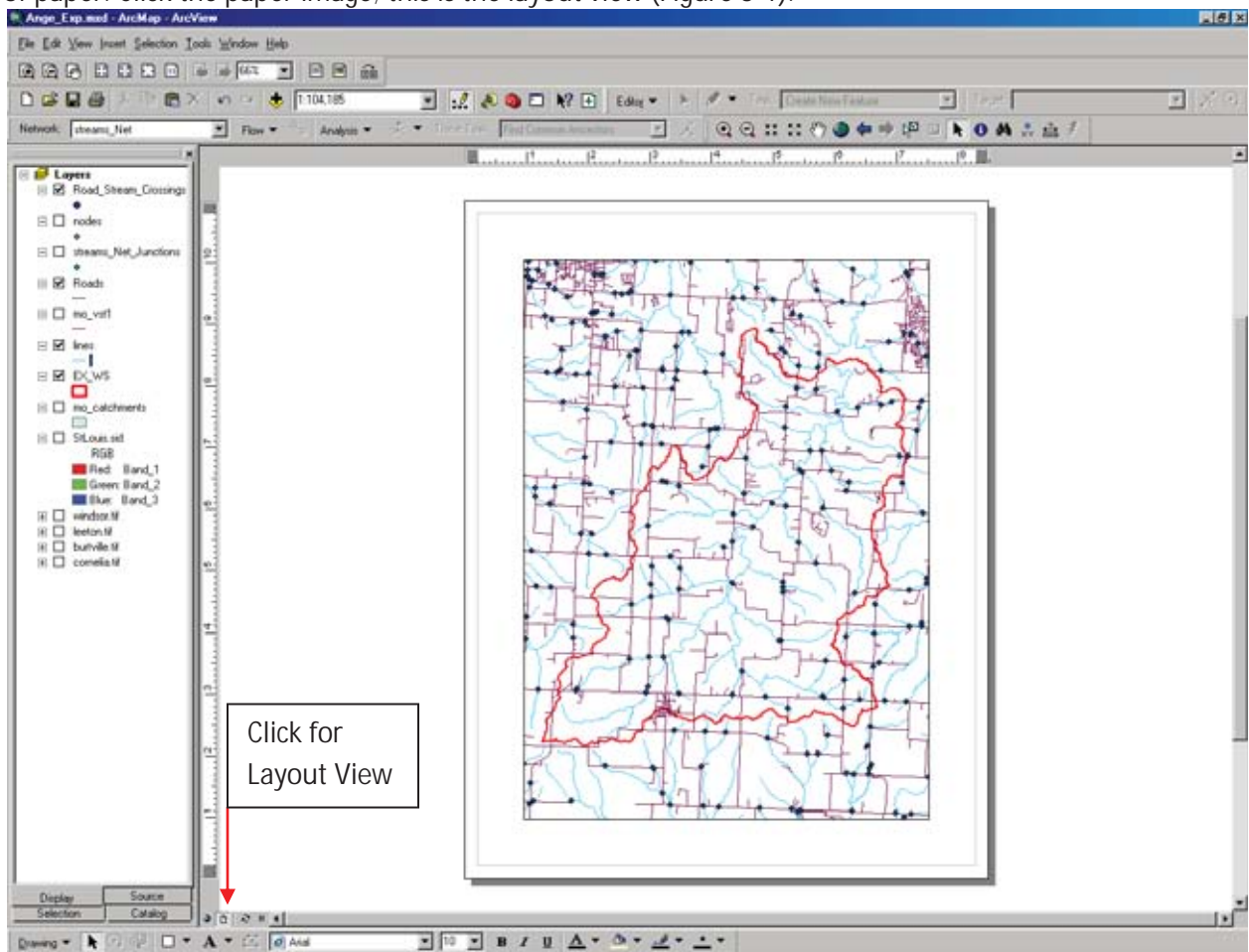



Figure 3-1

- c. Layout View is used for viewing a print product of your map. You will now want to add labels identifying roads in the roads layer. In the layer pane, right click **Roads** and select **Label Features** (Figure 3-2). After a few seconds or so, labels indicating road names or numbers will appear.

You may have to use the zoom tools  on the standard toolbar for them to be legible. Follow the same steps for adding label features to the **Road_Stream_Crossing.shp**.

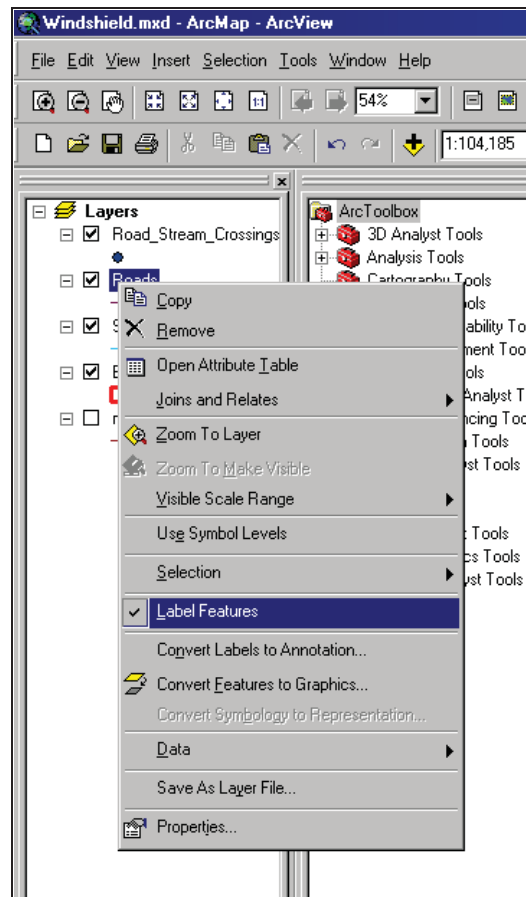


Figure 3-2

-The Road_Stream_Crossing.shp Label Features are set to show the ID field and need to be changed to display the FID field to show the unique values of the points. Right click Road_Stream_Crossings layer in the table of contents and select Properties. From the Layer Properties Box, select the Labels tab (1) (Figure 3-3). In the Labels tab, under Text String, change the Label Field from ID to FID (2). From the Labels Tab you can also edit Label Feature appearances. Change the font to something smaller (like 7) and the color to something other than black (like blue). Apply the Changes and select OK.

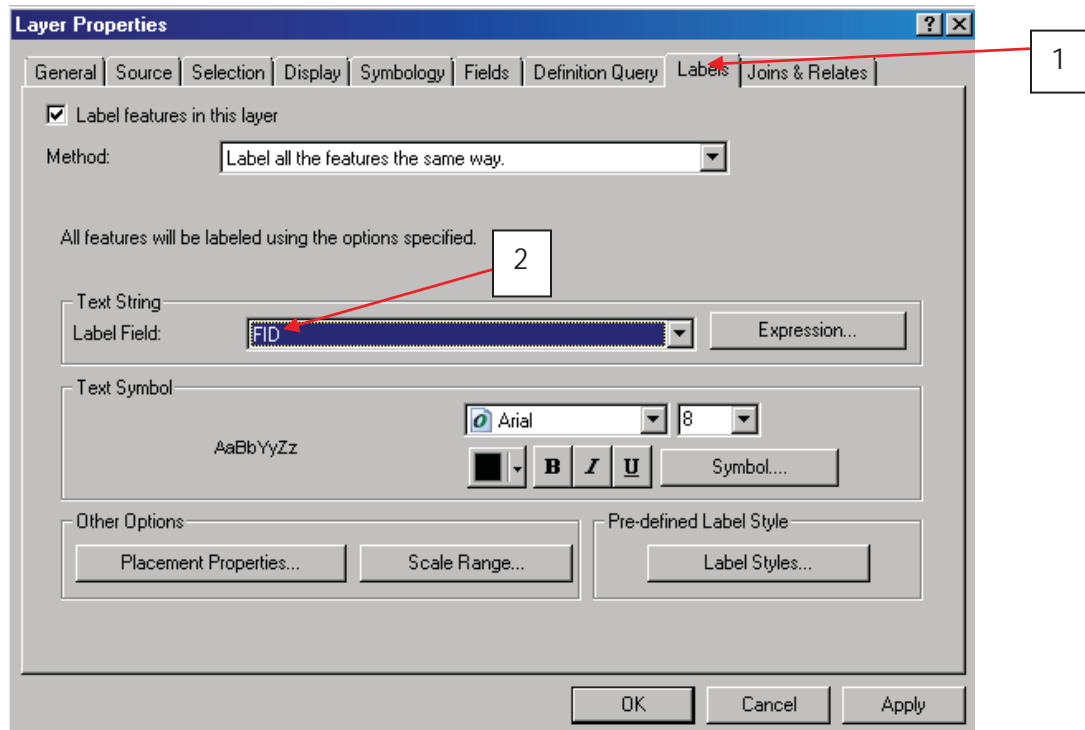


Figure 3-3

4. In the bottom left-hand corner of ArcMap, you will see the draw tools (1) (Figure 4-1). With these tools you can draw lines, polygons, and points. To select different kinds of draw tools, select the black drop down arrow next to the white box (2) and examine your options. When you find the appropriate tool, select it and you can proceed to draw on your map.

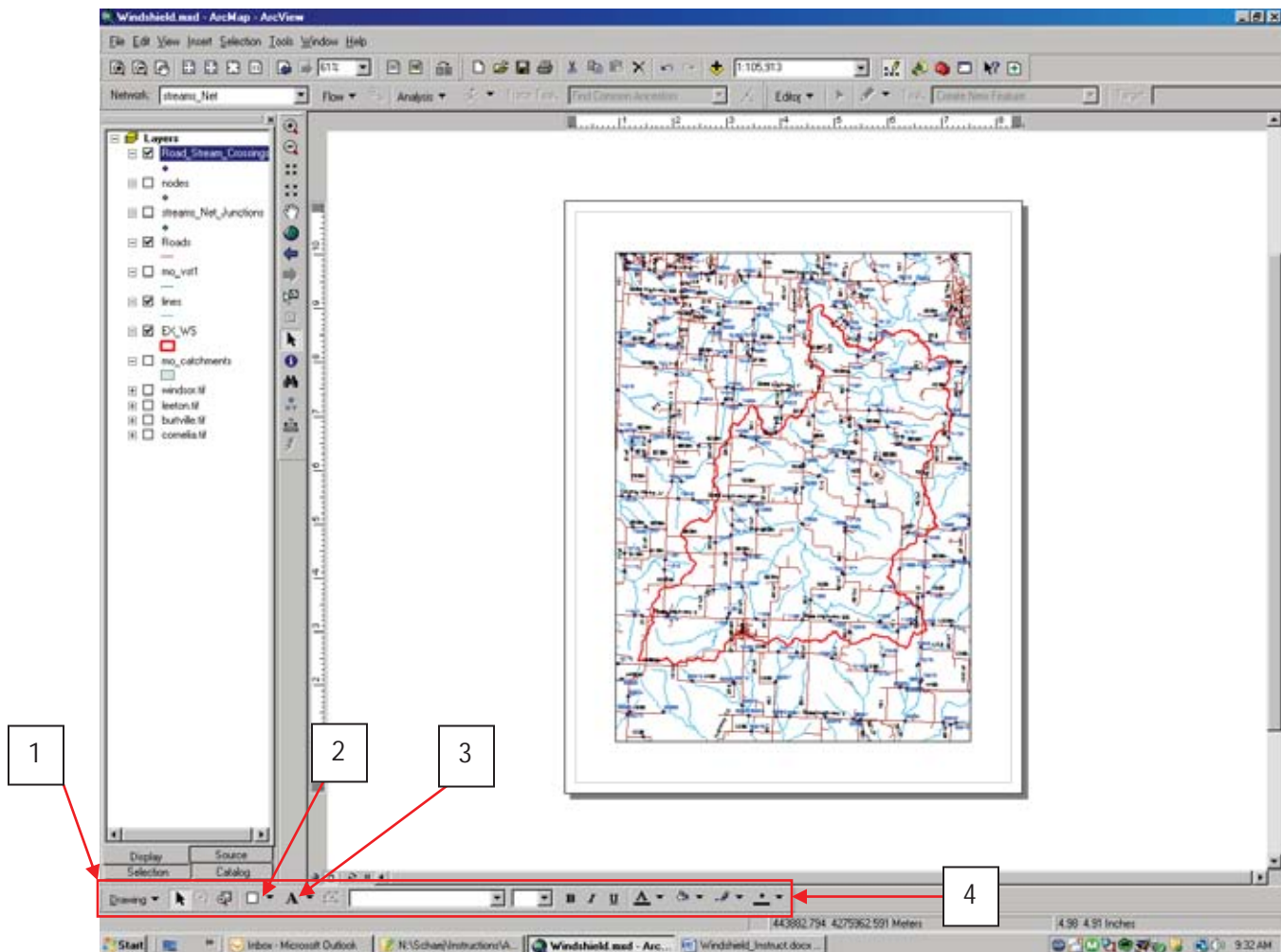


Figure 4-1

- a. To add a heading or text to your layout view map, select the New Text Icon (3) (Figure 4-1) and click on the layout where you wish to type. Now, once you have selected the area you can type your information. To modify the font or text size of the text, double click the text box you just created and from there you will be able to modify the text's appearance under the Text tab→ Change symbol box. You can also make modifications to the text in the Drawing toolbar. (3)
- b. To add a Scale Bar, in the main headings of ArcMap select [Insert→Scale Bar]. From the pop-up screen, select a scale bar and select OK. A scale bar will appear in the middle of your layout view. Drag it to the top or bottom of your map and re-size it if necessary (Figure 4-2). Select the units of measurements you prefer by double clicking the scale bar, and under the Units Box, change Unit Measurements.

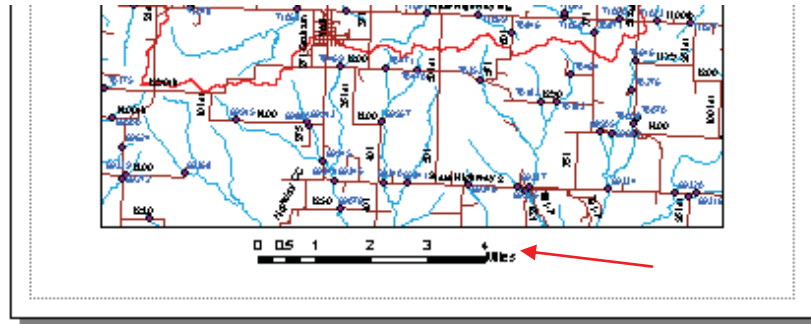



Figure 4-2

- c. To add a North Arrow, in ArcMap main menu, select [Insert→North Arrow]. Much like the scale bar, choose the one that you desire and select OK. Then, on the map move it to its desired location.
- d. With all of the desired map attributes properly entered, you will be ready to print. If you are planning to print, use print preview to verify that all things are properly displayed on the map. (Often, there can be discrepancy between what is shown in Layout View and what is actually printed.) If you wish to save the layout view, click File > Export Map. Browse to a desired location, name the file and ensure that JPEG is selected for the 'save as type:' Select Save.
- e. From the full extent view of your merged watershed, labels may not be legible (even with label features applied) if the watershed is very large. Using the zoom and pan tools  you can zoom to the sub watershed(s) of interest to make its labels visible. You can then use the layout view to make map(s) usable for driving the watershed (Figure 4-3), so that you can read road names and see the unique crossing FID numbers, which will be used to catalogue observations.

[illegible]

Figure 4-3

Guide Sheet 5:

Field Notes

(Using databases and GIS to keep track of field observations)

Field Notes Database Entry and Converting Spatial Data Instructions

1. Navigating to/Opening an Access Database

Navigate to the Field Notes Database and double-click to open. Re-save the database in your preferred location with a distinct name for the watershed. (XHD:\GIS\2010 Appendix C apps\Databases)

2. Understanding the Components of the Database

The database should appear as it does in (Figure 2.1)

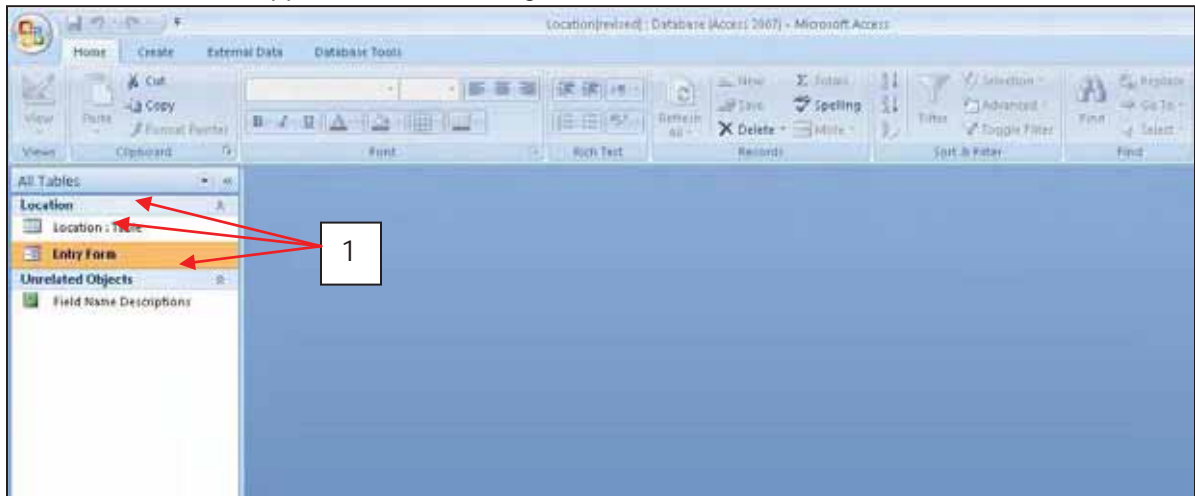


Figure 2.1

- a. On the left hand side of the window you will see three tables (1)(Figure 2.1) (Location: Table, Entry Form, and Field Name Descriptions) Double click Location: Table to open the data sheet.

- b. 'Location Table' (Figure 2.2) is the table that contains all of the input data. You can enter data here, but using the Entry Form may be easier.

ID	LOC_CODE	LOC_CROSS	STRMNAME	STRID	T_R_S	BASIN	CO_NAME	UTM_X
1	CF0001	525RD AND 501RD	UNNAMED TRIB			UPPER CLEAR FORK		
3	CF0004	501RD	UNNAMED TRIB			UPPER CLEAR FORK		
4	CF0005	321RD	UNNAMED TRIB			UPPER CLEAR FORK		
5	CF0007	600RD	UNNAMED TRIB			UPPER CLEAR FORK		
6	CF0011	251RD	LONG BRANCH			UPPER CLEAR FORK		
7	CF0012	PPHWY	UNNAMED TRIB			UPPER CLEAR FORK		
8	CF0021	321RD	UNNAMED TRIB			UPPER CLEAR FORK		
9	CF0028	301RD	UNNAMED TRIB			UPPER CLEAR FORK		
10	CF0025	251RD	UNNAMED TRIB			UPPER CLEAR FORK		
11	CF0024	251RD	UNNAMED TRIB			UPPER CLEAR FORK		
12	CF0023	251RD	UNNAMED TRIB			UPPER CLEAR FORK		
13	CF0022	201RD	UNNAMED TRIB			UPPER CLEAR FORK		
14	CF0031	201RD	MINERAL FORK			UPPER CLEAR FORK		
15	CF0034	2HWY AND 13HWY	MINERAL FORK			UPPER CLEAR FORK		
16	CF0048	2HWY	MINERAL FORK			UPPER CLEAR FORK		
17	CF0036	251RD NEAR 2HWY	MINERAL FORK			UPPER CLEAR FORK		
18	CF0049	1200RD	MINERAL FORK TRIB			UPPER CLEAR FORK		
19	CF0038	2HWY E OF LEETON	MINERAL FORK TRIB			UPPER CLEAR FORK		
20	CF0037	301RD	MINERAL FORK			UPPER CLEAR FORK		
21	CF0018	PPHWY	CLEAR FORK CREEK			UPPER CLEAR FORK		
22	CF0013	471RD	UNNAMED TRIB			UPPER CLEAR FORK		
23	CF0009	471RD	UNNAMED TRIB			UPPER CLEAR FORK		
24	CF0010	BTWN 700RD AND 710RD	CLEAR FORK CREEK			UPPER CLEAR FORK		
25	CF0015	800RD	BELL BRANCH			UPPER CLEAR FORK		
26	CF0019	850RD	COOPERAS CREEK			UPPER CLEAR FORK		
27	CF0008	650RD AND 701RD	COOPERAS CREEK			UPPER CLEAR FORK		
28	CF0006	651RD	BELL BRANCH			UPPER CLEAR FORK		
29	CF0007	650RD	CLEAR FORK CREEK			UPPER CLEAR FORK		
30	CF0003	651RD	COOPERAS CREEK			UPPER CLEAR FORK		
31	CF0014	651RD	BELL BRANCH			UPPER CLEAR FORK		
32	CF0016	601RD	EPP BRANCH			UPPER CLEAR FORK		
33	CF0017	601RD	UNNAMED TRIB			UPPER CLEAR FORK		
34	CF0027	601RD	UNNAMED TRIB			UPPER CLEAR FORK		
35	CF0029	601RD	UNNAMED TRIB			UPPER CLEAR FORK		
36	CF0030	1000RD	UNNAMED TRIB			UPPER CLEAR FORK		
37	CF0042	771RD	UNNAMED TRIB			UPPER CLEAR FORK		
38	CF0041	550RD	CLEAR FORK CREEK			UPPER CLEAR FORK		

Figure 2.2 (Table View)

- c. The 'Field Name Descriptions' table (1) (Figure 2.3) can be found in the Table of Contents on the left and is a listing of all of the field name descriptions in the Location: Table. This can be referred to for a detailed description of data to be entered in each box.

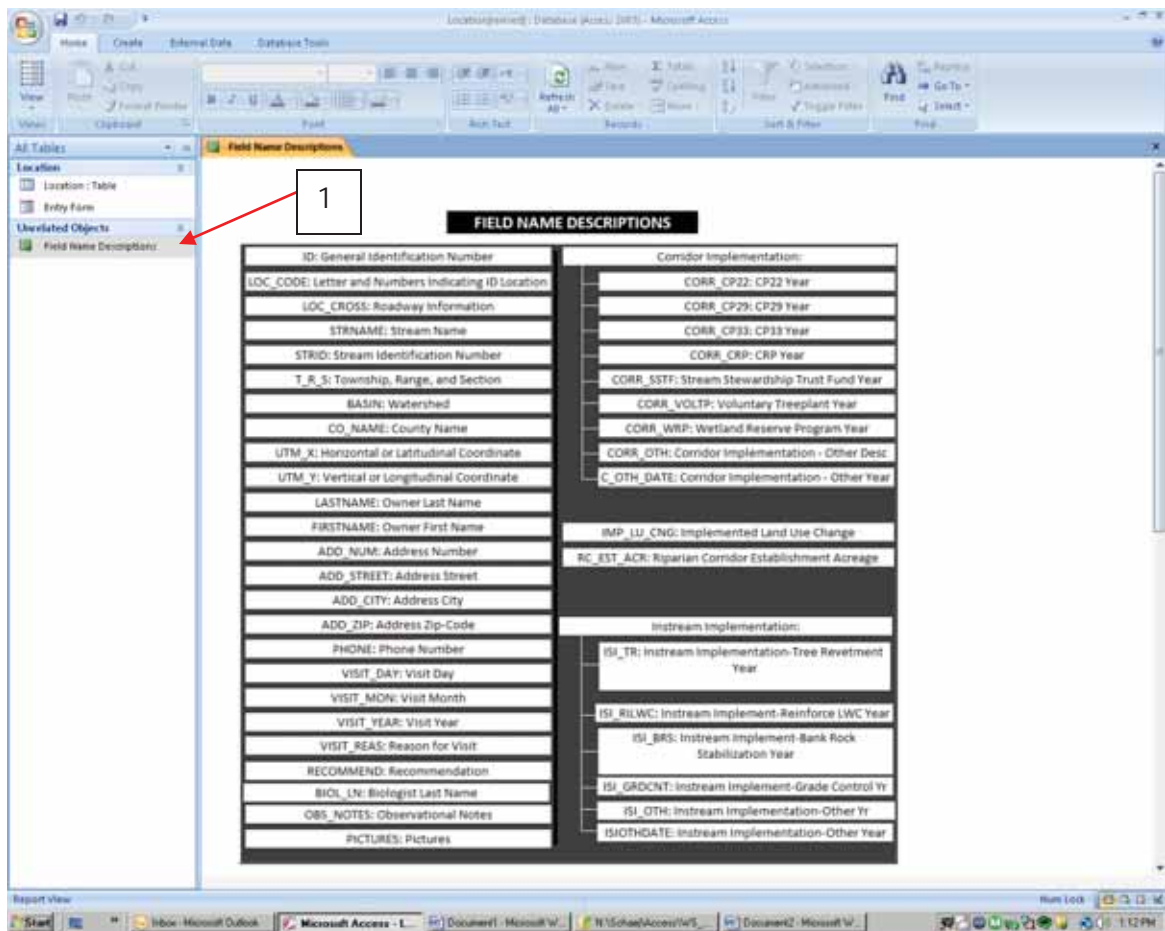


Figure 2.3

3. Entering data into your database.

Use the 'Entry Form' to input collected data into the appropriate field.

*Note that some fields have restrictions on the type of data that can be inputted. (For example, most of the 'Corridor Implementation' fields only allow numbers in the input boxes. i.e. 2004) This is done to create data consistency for the data input process. Also, the UTM X and Y data is required to represent the data in ArcMap as a shapefile.

a. When the entry form is first opened, it will display a record that was previously entered. In order to input new data, you need to add a new record. In Figure 3.1 you will see command buttons at the bottom of the entry form. Select '**Add New Record**' (1) to create a new entry form.

The screenshot shows the Microsoft Access 'Location: Entry Form'. The form contains several fields for data entry, including Stream Name, Stream ID, Township, Range, Section, Basin, County Name, X-Coordinate, Y-Coordinate, Owner Last Name, Owner First Name, Address Number, Address Street, Address City, Address Zip, Phone Number, Visit Day, Visit Month, Visit Year, Visit Reason, Recommendation, Biologist Last Name, Observer Notes, and Pictures. There are also fields for various years (CP20, CP21, CRP, Stream Stewardship Trust Fund, Voluntary Treeplant, Wetland Reserve Program, Other Date) and sections for Implemented Land Use Change, Riparian Corridor Establishment Acreage, and Instream Implementation (Tree Revegetation, Reinforced Low Water Crossing, Rock Bank Stabilization, Grade Control, Other Date). At the bottom of the form, there are command buttons: 'Print Current Record', 'Add New Record', 'First Record', 'Previous Record', 'Field Name Descriptions', 'Search Records', 'Last Record', and 'Next Record'. Red arrows and numbered boxes highlight specific elements: box 2 points to the 'Add New Record' button, box 3 points to the 'Print Current Record' button, and box 1 points to the 'Add New Record' button.

Figure 3.1

Once '**Add New Record**' is selected, all of the fields will be blank. Input your data accordingly.

4. Printing Records

- At the bottom of the entry form there is also a command button to 'Print Current Record.' By selecting the command, Access will print only the opened record. Without this command, selecting print through the Office Button would print all records.

5. Saving your newly input data.

- a. Once the data has been entered into the entry form, it will need to be saved. Enter your data and click the save button in the Access Main Menu. (2) (Figure 3.1)
(*Note: Not all fields need to be entered, only those that apply.)

- b. Now, once the Location: Table is opened, the newest entry should be visible.

6. Querying Specific Records

- a. To search for specific records within the database, navigate to the Location: Table (1) (Figure 5.1). If it is not open, double click it to make it appear.

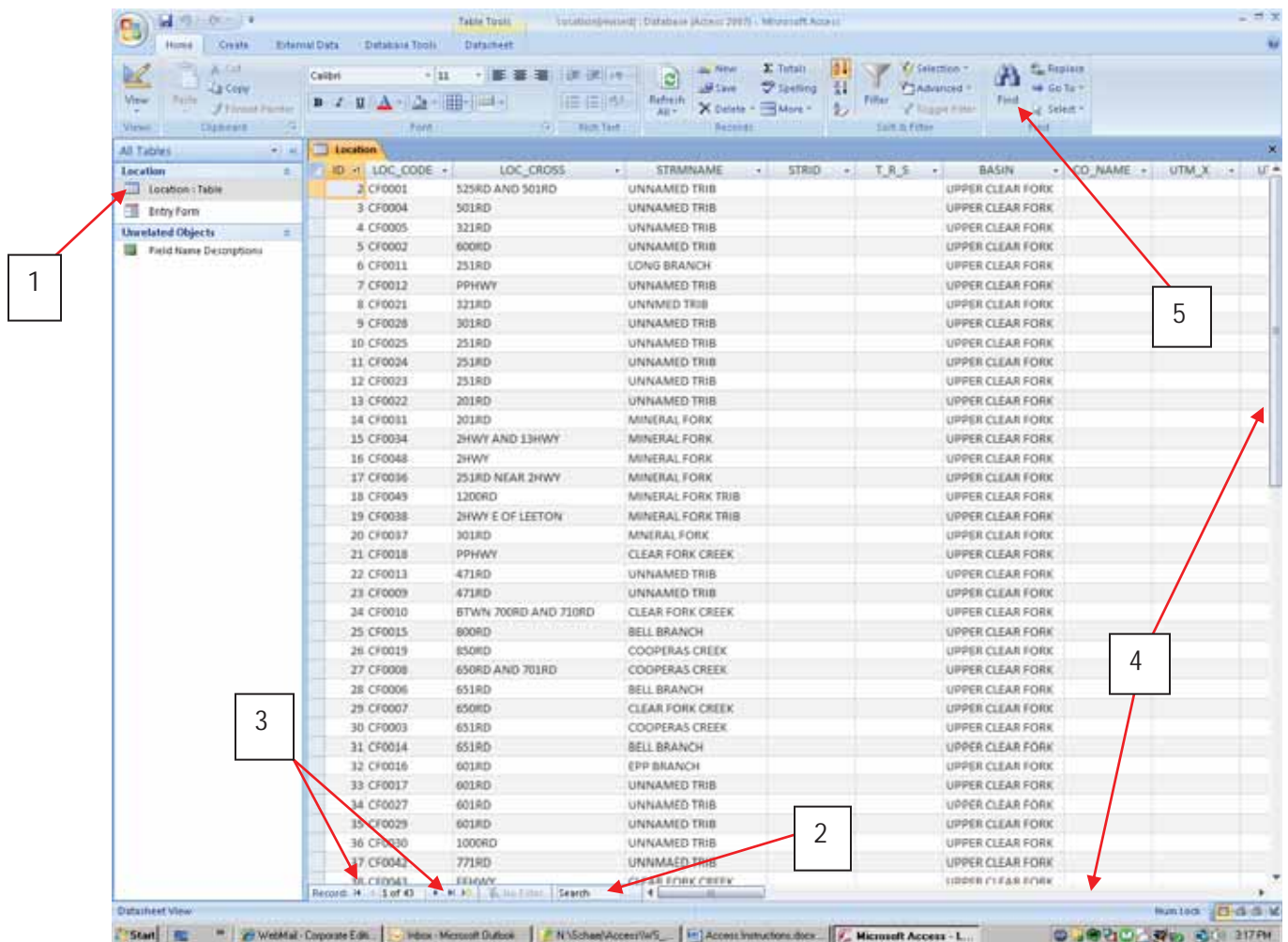


Figure 5.1

- b. To search for specific items within the database use the 'Search' bar (2) (Figure 5.1) at the bottom of the table or use the arrow buttons (3) to navigate from record to record.
- c. The scroll bars (4) (Figure 5.1) located on the bottom and right can also be used to navigate throughout the database. The Find tool (5) can also be useful in locating certain data within the table.

7. Deleting Records

- In the Location: Table records can be deleted if need be. Like in step 5.a, navigate to the table and open it.
- Once opened, navigate to the record (records run horizontally across the screen.) Right click the appropriate box on the left-hand side of the ID field and choose Delete Record (Figure 6.1)

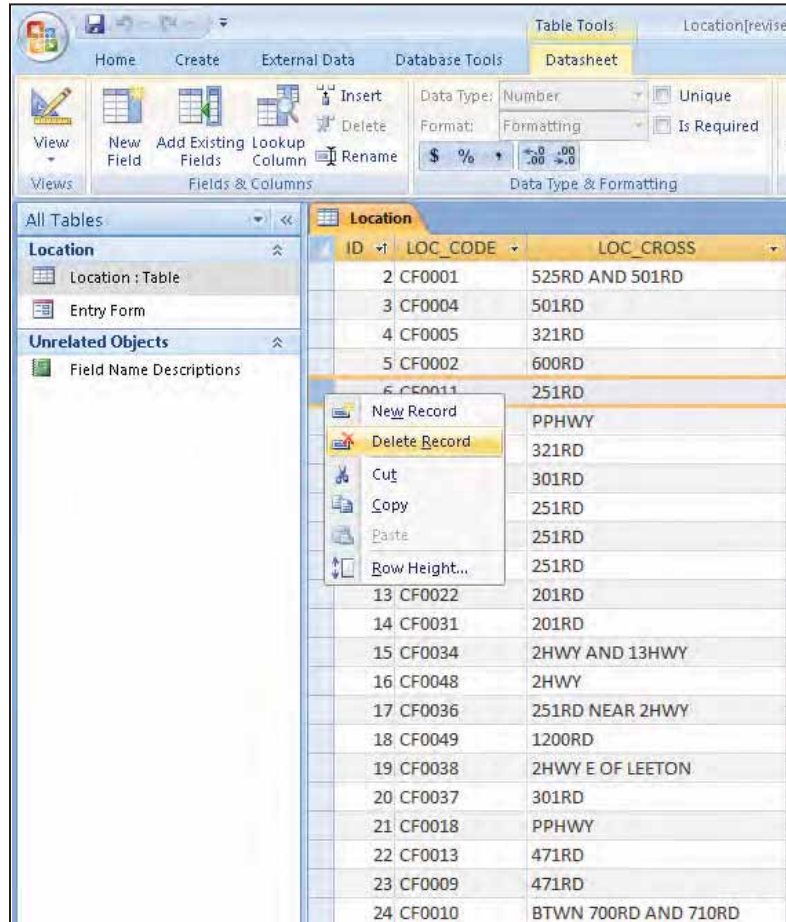


Figure 6.1

8. Exporting the Table

- a. The table will need to be converted to a text file in order that it can be opened in ArcMap. In Access, right click on **Location** in the table of contents then select **Export**, then **Text File**. Figure 8.1

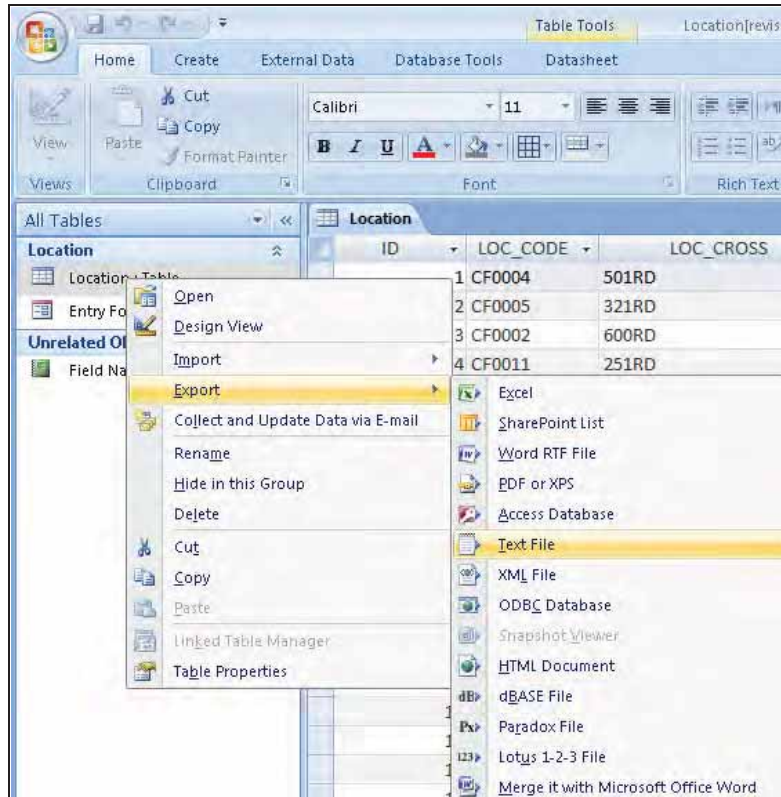


Figure 8.1

- b. In the "Export-Text File" dialog box, click browse and navigate to the location where you wish to save the exported text file. (Figure 8.2). Click OK

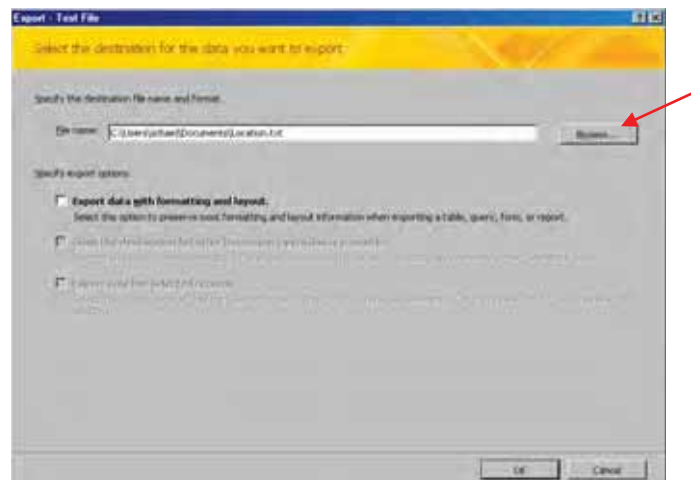


Figure 8.2

- c. The Export Text Wizard box will appear (Figure 8.3). Make no changes and click next to navigate to the next box.
- d. Now in the Export Text Wizard box select "Include Field Names on First Row" and select Next. (Figure 8.3)

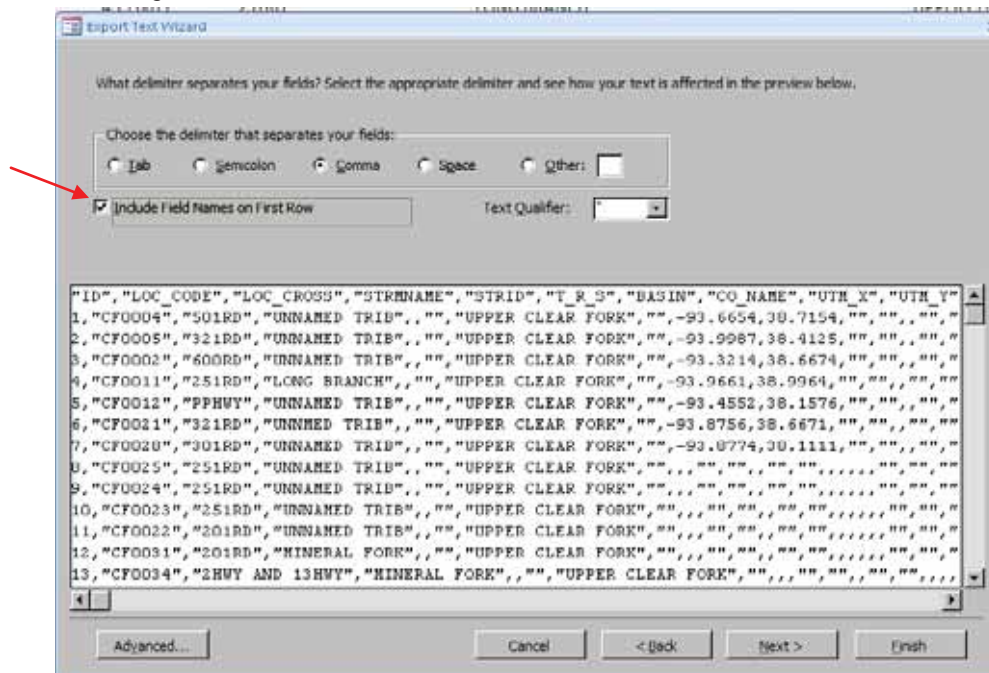


Figure 8.3

- e. The next dialog box is used to verify that the location of your file is correct. Click Finish to proceed with the same location that was browsed to earlier, or type in a new location if you wish to create another file. (Figure 8.4)

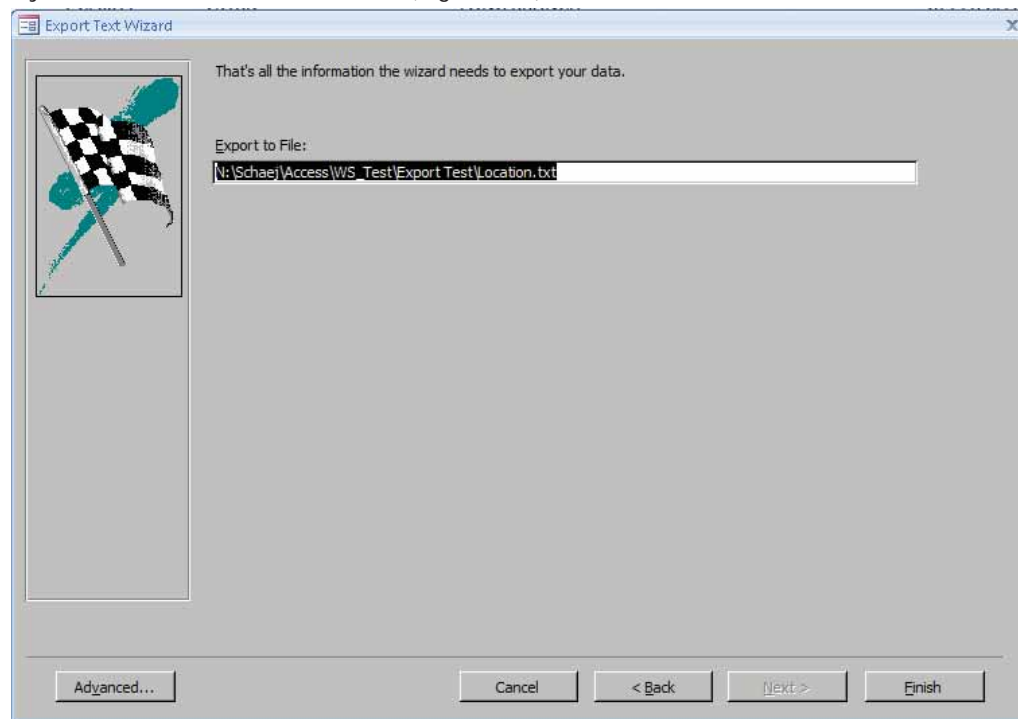


Figure 8.4

*After clicking finish, a box may appear asking if you wish to save the export steps. If you would like these settings to be set as your default, check the box, if not, click Close.

9. Opening the table in ArcMap

- a. Now that a text file has been created from the Access file, open ArcMap and add the location table data to the ArcMap table of contents. Using the Add Data Tool (1) (Figure 9.1), navigate to the Location table that you exported as a text file and select add (2).

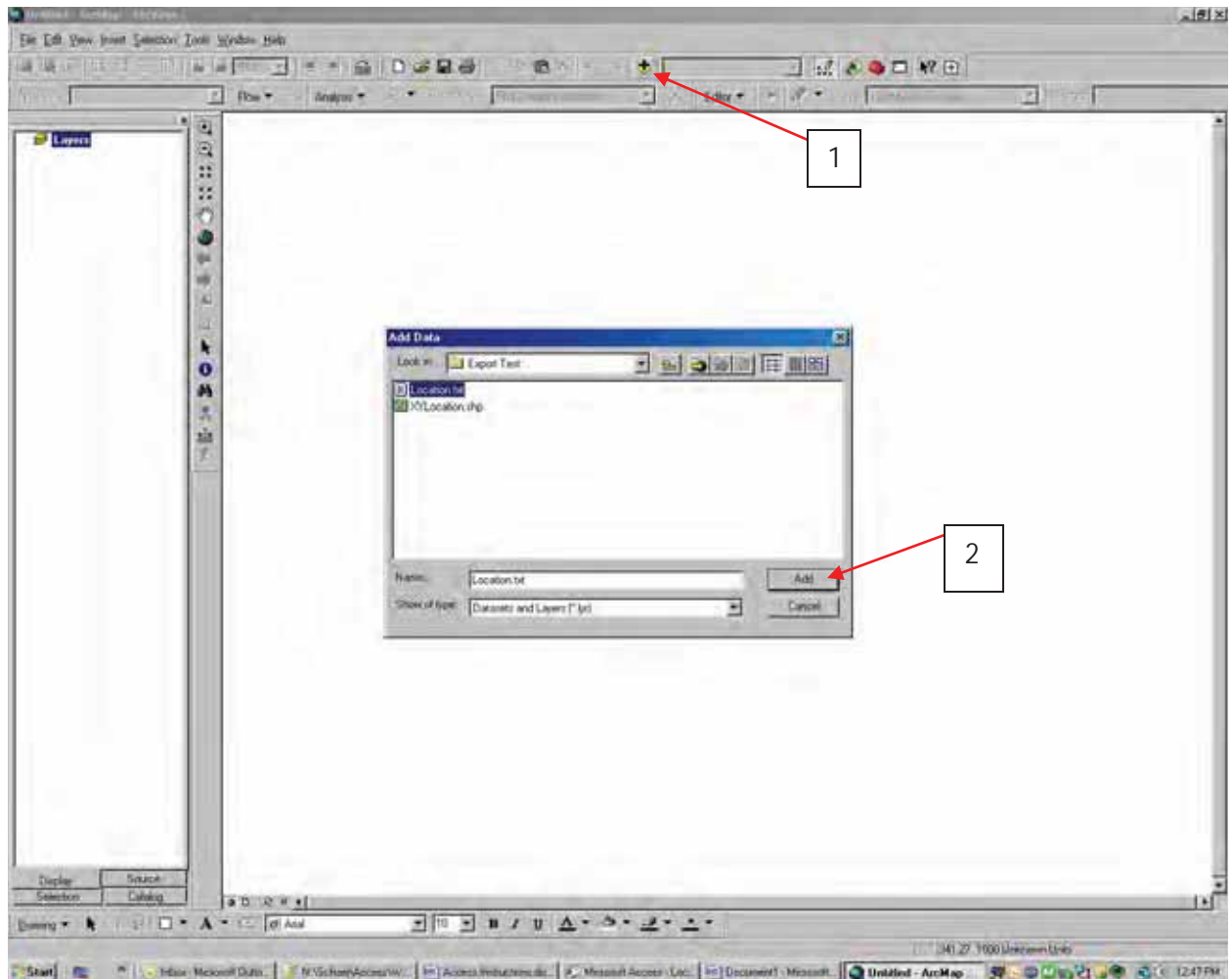


Figure 9.1

- b. Now, right-click Location.txt in the Table of Contents and select Display XY Data. (Figure 9.2)



Figure 9.2

- c. In the Display XY Data box, Change the X-Field dropdown box to UTM_X and the Y-Field dropdown box to UTM_Y. (1)(Figure 9.3)

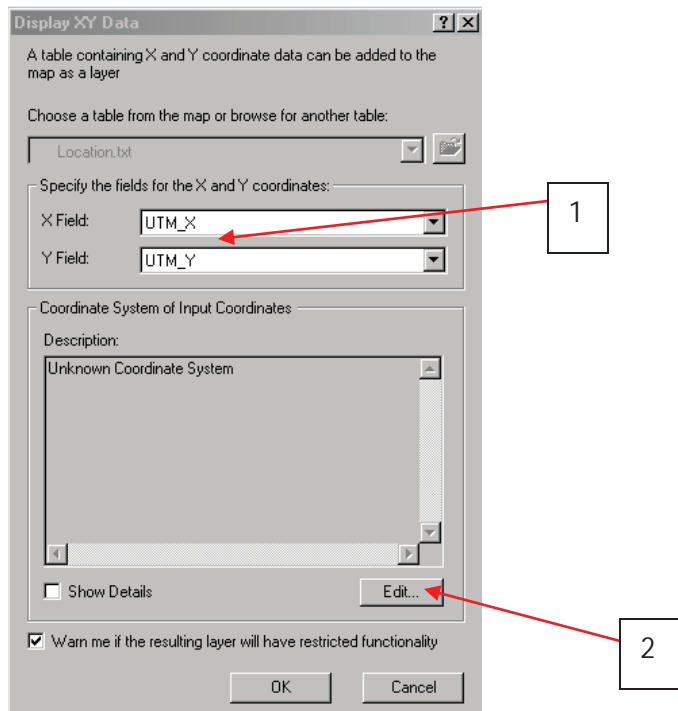


Figure 9.3

- d. Before closing the XY Data box, click edit below the coordinate system box. (2)(Figure 9.3) In the Spatial Reference Properties Box, click Select to navigate to the appropriate coordinate system data. (Figure 9.4)

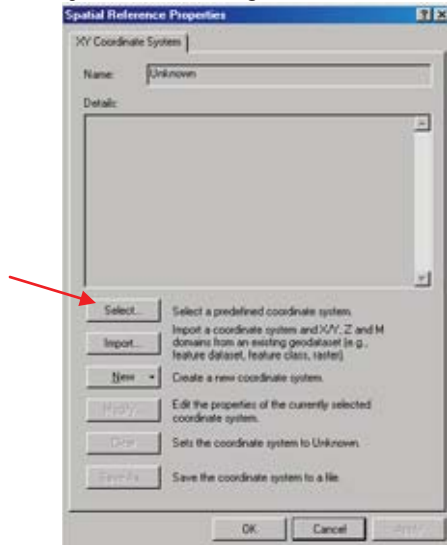


Figure 9.4

-Now navigate to **Projected Coordinate Systems > Utm > NAD 1983 > NAD 1983 UTM Zone 15N.prj** and click add. Apply the settings and choose OK. Select OK in the XY Data box.

*If a prompt box appears telling you that the Table has no Object-ID field, click OK.

*After doing so, you will see that the entries on the table that had UTM_X and UTM_Y coordinates represent spatially in ArcMap.

e. In order to highlight these features in ArcMap, the files will have to be exported to a shapefile. In the ArcMap Table of Contents, right click Location.txt Events and choose Data>Export Data. (Figure 9.5)

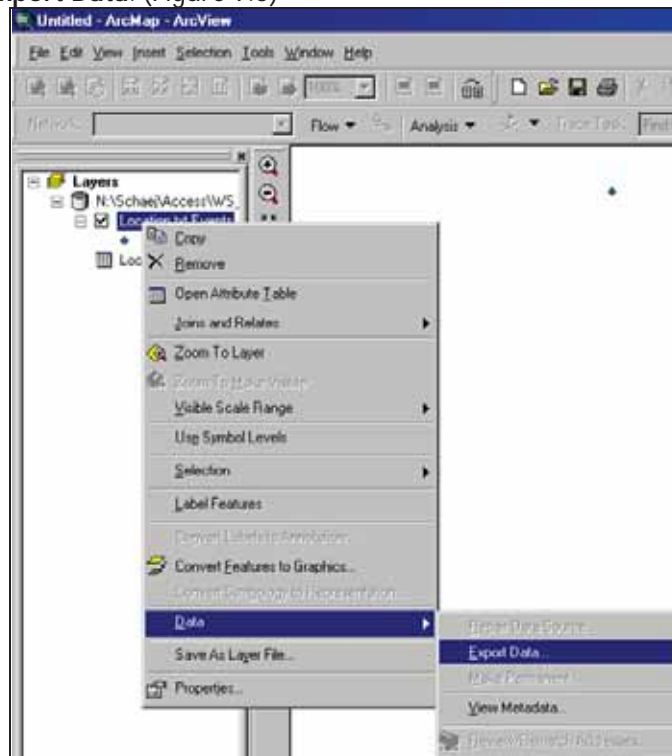


Figure 9.5

-In the Export Data box, select the Browse button and navigate to where you would like the shapefile to be stored. Name the shapefile and select OK. (Figure 9.6) Click OK in the Export Data box to apply the settings.

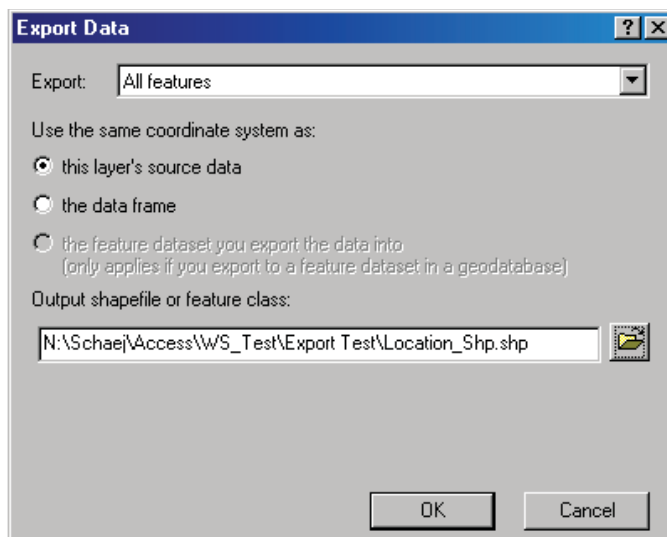


Figure 9.6

*When ArcMap asks you if you would like to add the exported data to the map as a layer, choose Yes.

f. The Location shapefile now appears in the ArcMap table of contents. You can right click the shapefile in the ArcMap table of contents to open the attribute table and select by attributes to query specific results in the table's data.

a. In the Table of Contents, right click Location.Shp and select Open Attribute Table.(Figure 9.7)

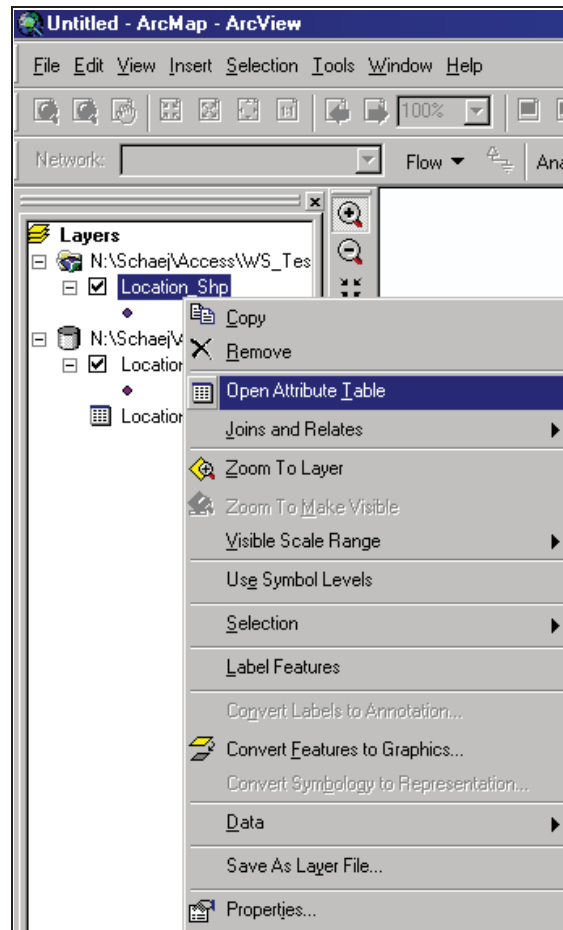


Figure 9.7

- b. With the attribute table open, click 'Options' at the bottom, and then 'Select by Attributes.' (Figure 9.8)

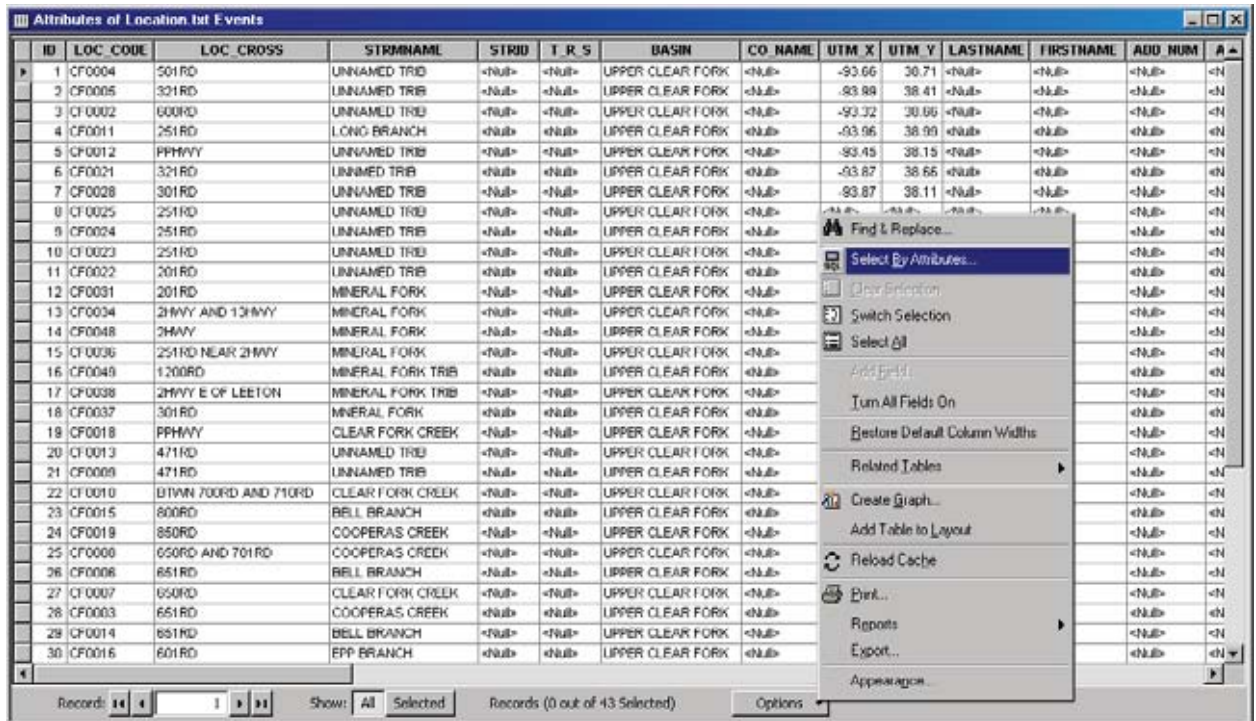


Figure 9.8

- c. In the select by attributes box, in the field box (1)(Figure 9.9), double click the field that you wish to query to add it to results box (2). Once you have double clicked the desired field, it will appear in the results box. Your query will need to be followed by an equals sign. Select '='. (3)(Figure 9.9)

*As an example, Figure 9.9 will find all Clear Fork Creek results.

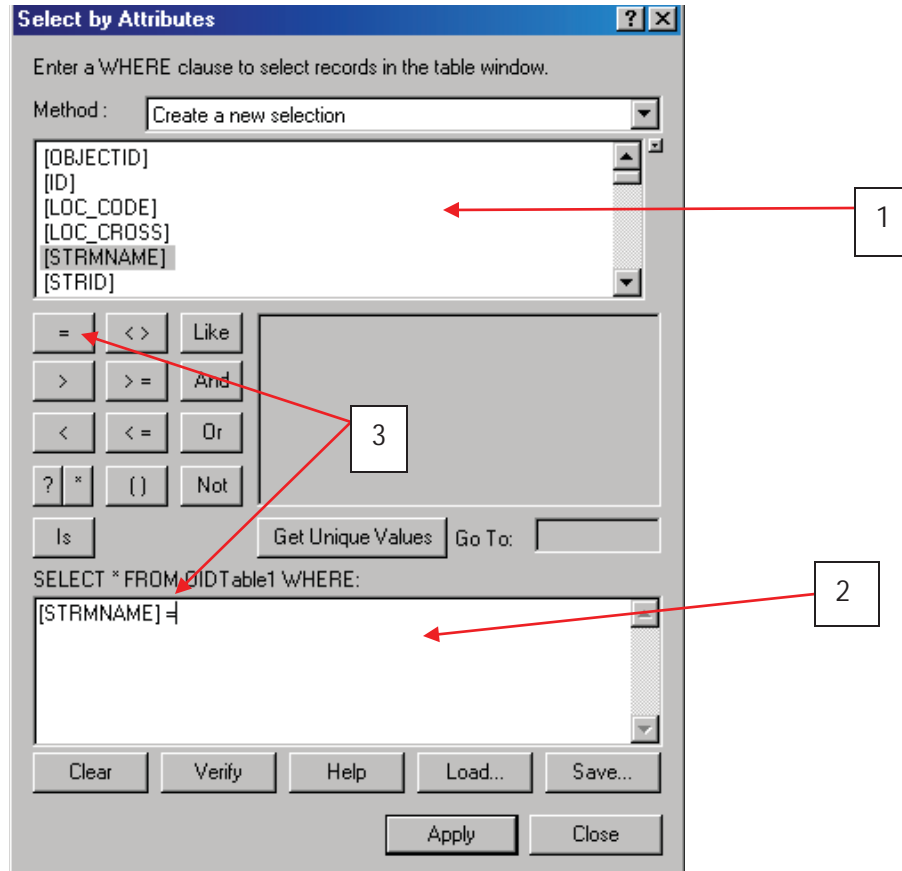


Figure 9.9

- d. Once a field from the field box has been selected and moved to the results box, you can search by unique values. Click 'Get Unique Values' (4)(Figure 9.9) to compile a list of all available Stream names.

Scroll to double click 'Clear Fork Creek' in the resulting box to add it to the query box.
(Figure 9.10)

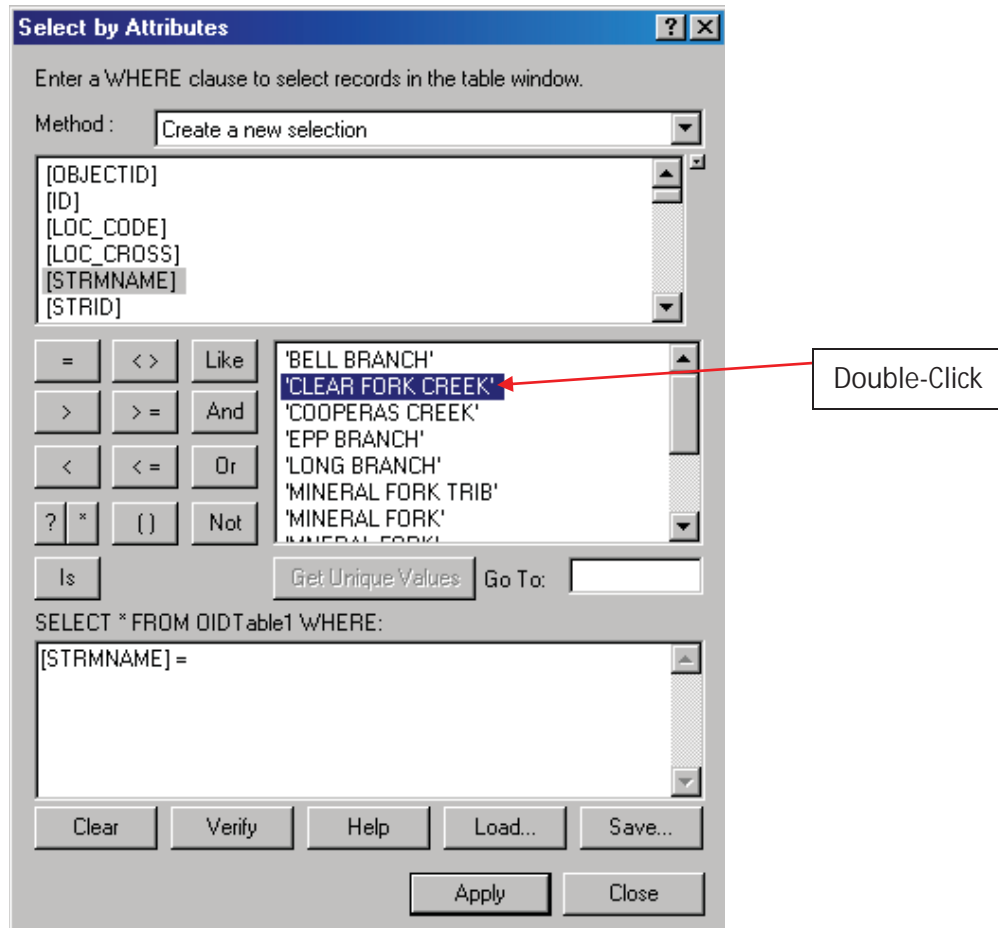


Figure 9.10

- e. Your results box should appear as follows. (Figure 9.11) Click apply, then close the Select by Attributes box. This will highlight all points associated with Clear Fork Creek in the map view.

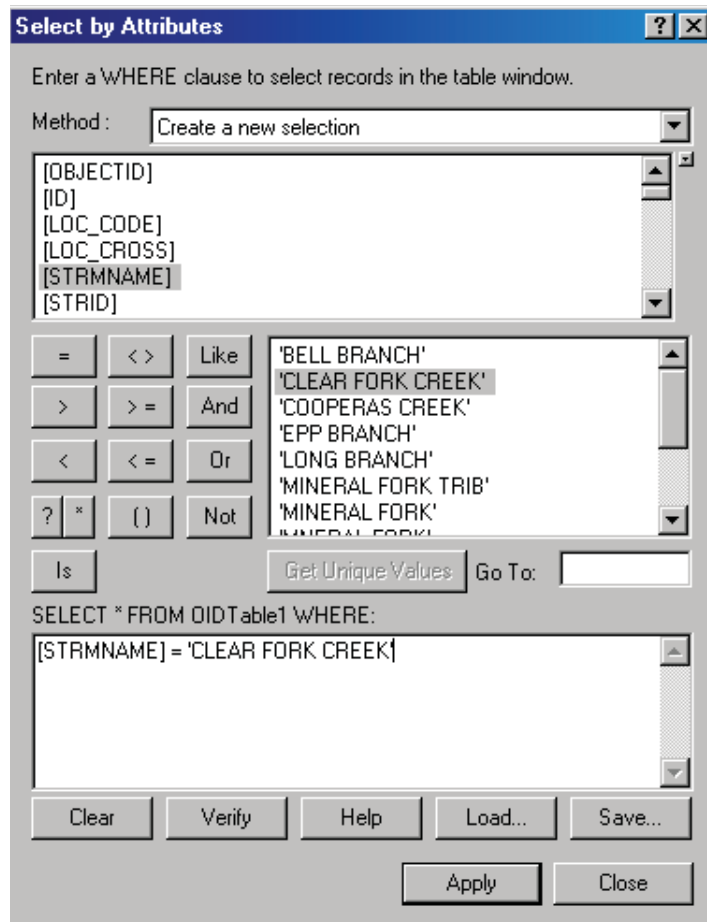


Figure 9.11

- f. As a result, the features selected in the Select by Attributes box will appear highlighted in map view. (Figure 9.12)

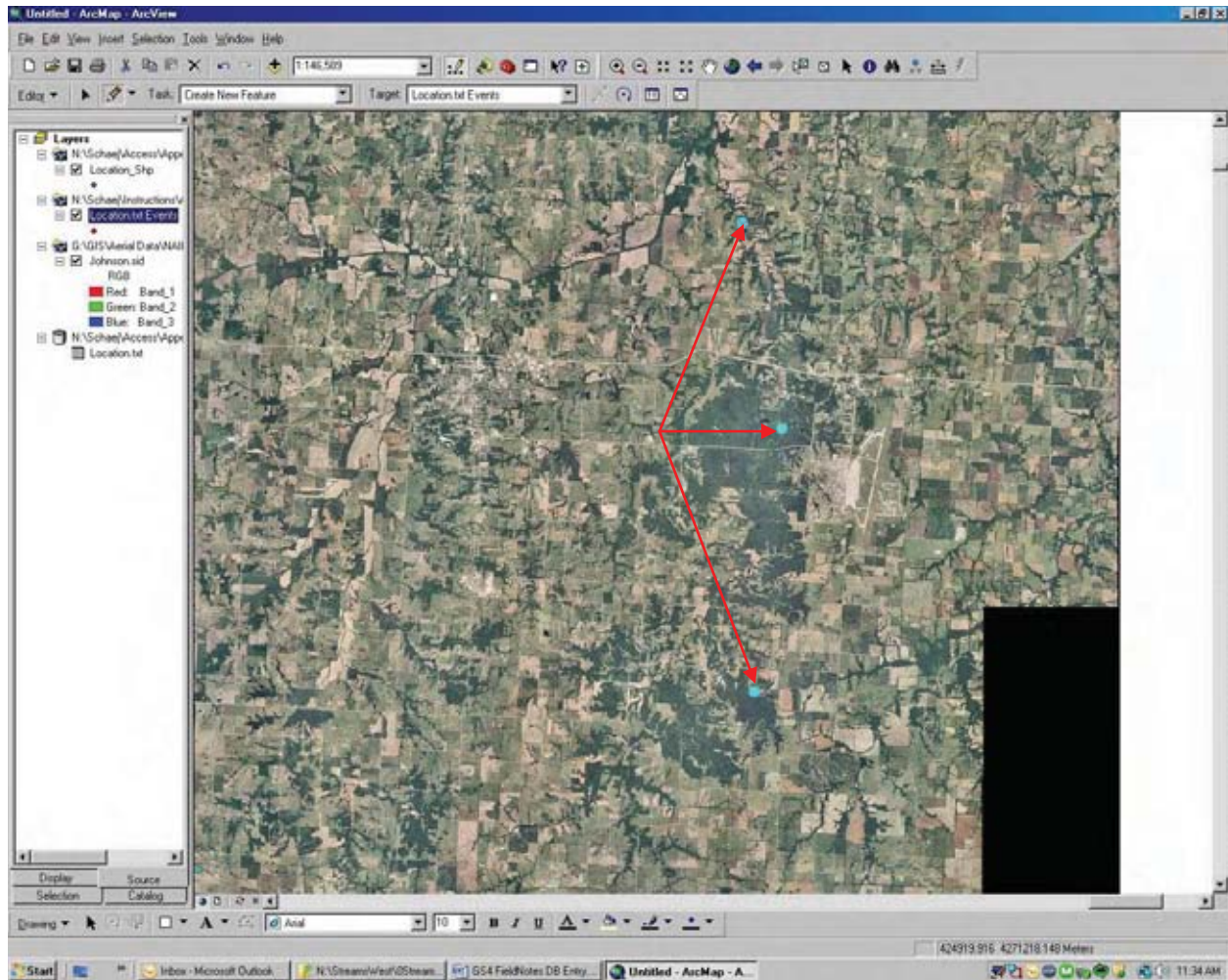



Figure 9.12

Guide Sheet 6:

Displaying Aquatic Records

(Searching existing databases for biological records within a watershed)

How to Identify the Aquatic Species List for an ACOA

1. Open a blank ArcMap document.
2. Use the Add Data Tool  (1) (Figure 2-1) and navigate to the Aquatic COA data (XHD:\GIS\AquaticGAP\Aquatic Data\Conservation Priorities\MDC COAs). Select the data and click Add to add the shapefiles to the ArcMap Table of Contents.
 - a. Data Structure Layout > Aquatic Gap

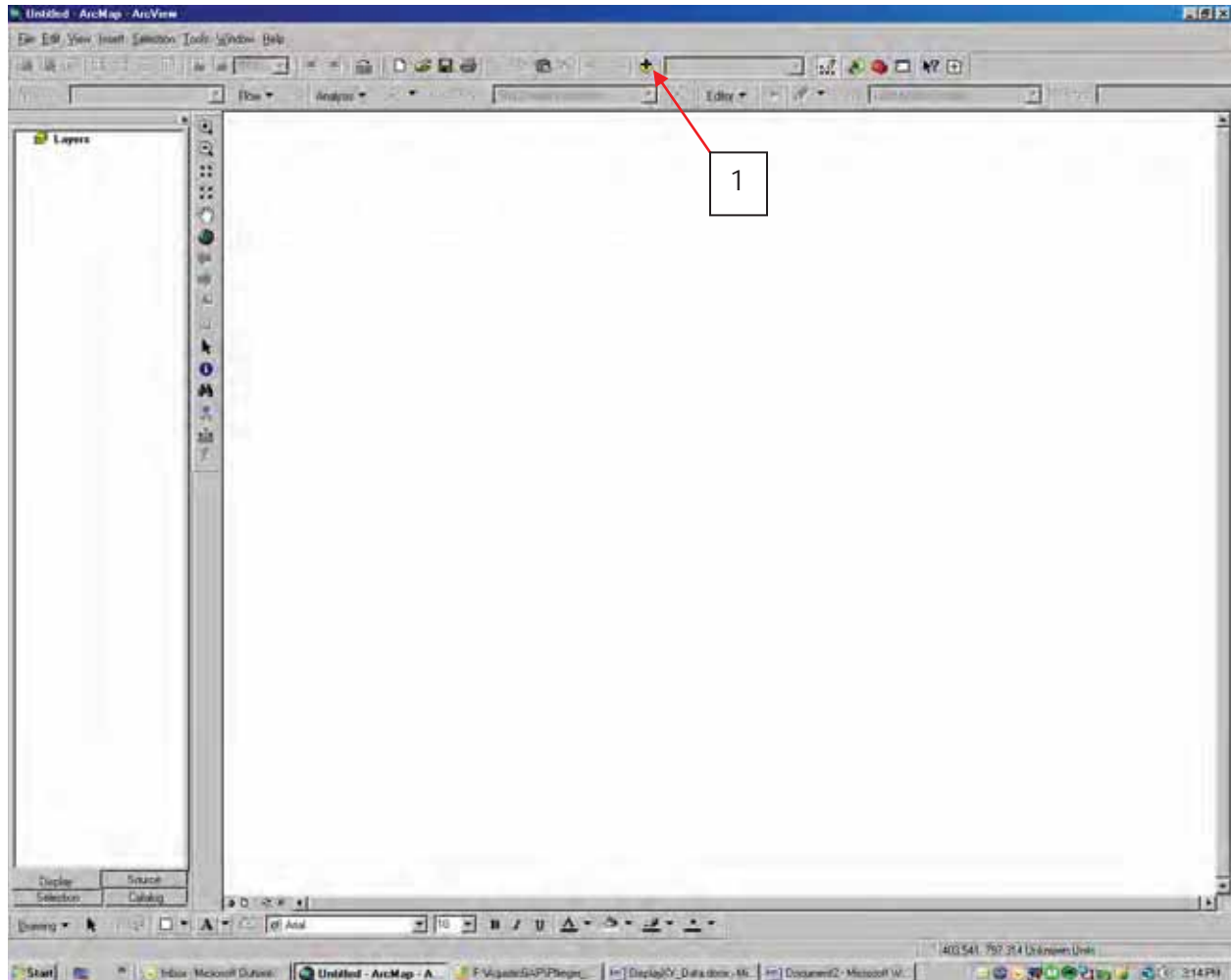


Figure 2.1

3. With the Aquatic and Pflieger (XHD:\GIS\AquaticGAP\Pflieger Region Data) data added, using the Add Data Tool, navigate to and add the STATEWID.dbf file. (XHD:\GIS\AquaticGAP\Aquatic Data\Biological\Collection Data\Actual BioData) (1) (Figure 3.1)
 - a. With the database file added to ArcMap, you will now be able to Add XY data in order for the data to be represented in shapefile form.

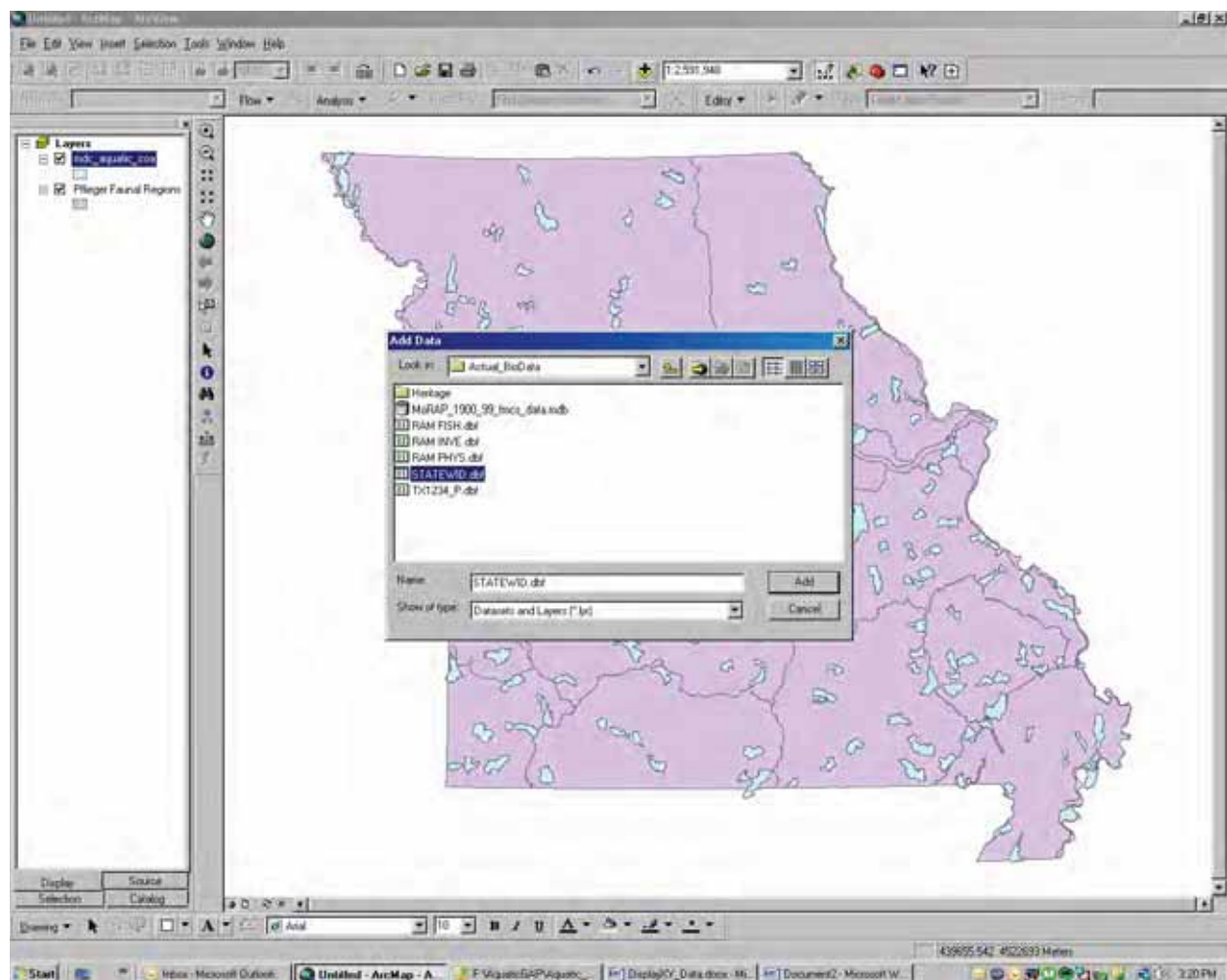


Figure 3.1

4. Adding the database (or .dbf) file will result in ArcMap switching the table of contents tab from 'Display' to 'Source'. (1)(Figure 4.1)

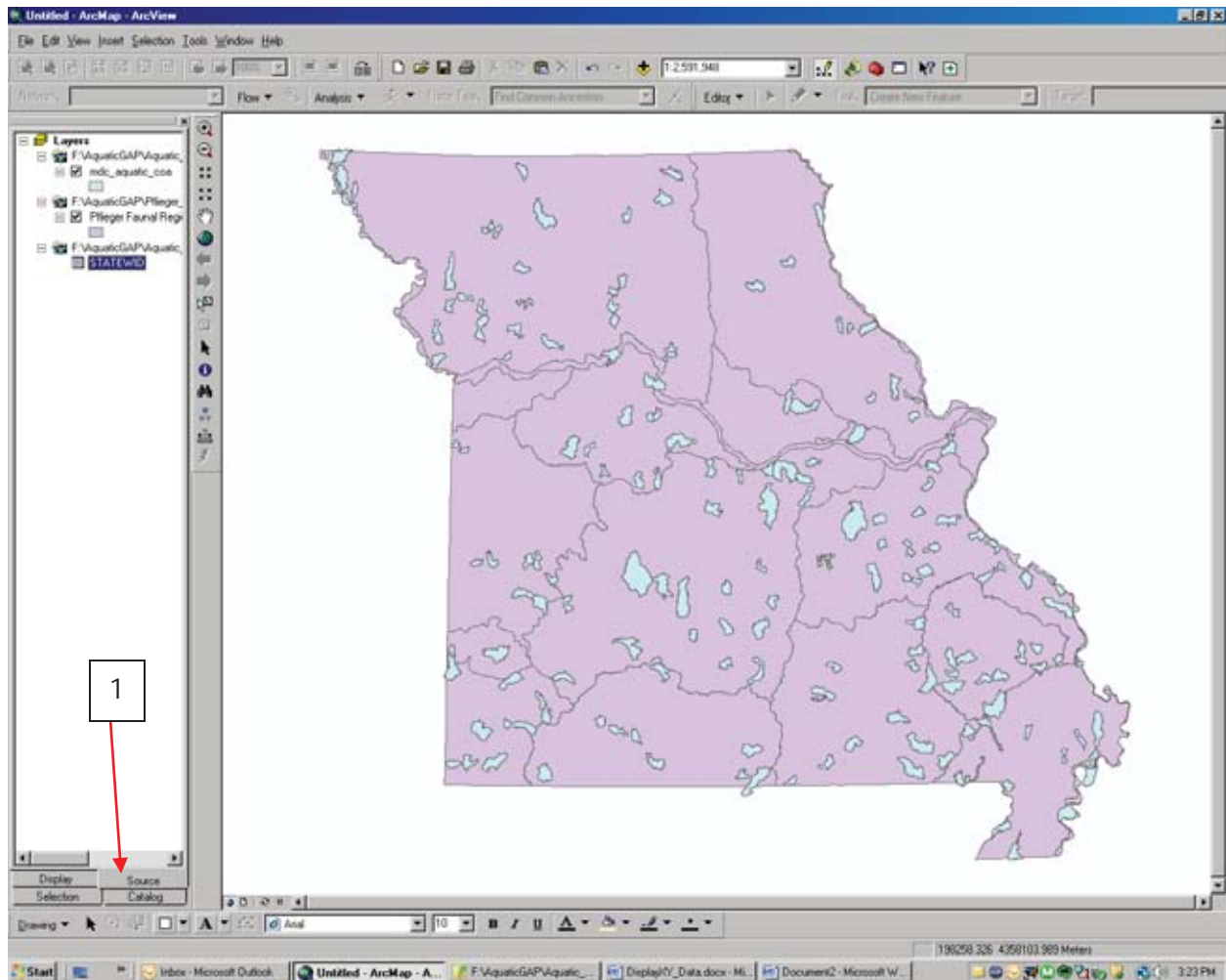


Figure 4.1

- a. With the database added, XY data can be added. Right click STATEWID in the table of contents and select 'Display XY Data'. (1)(Figure 4.2)

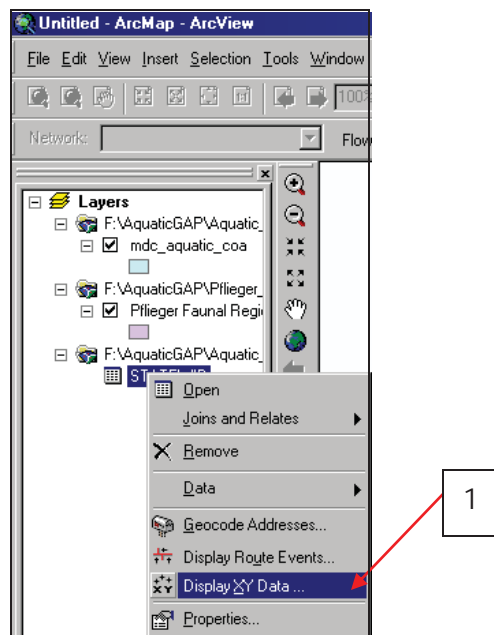


Figure 4.2

- b. In the Display XY Data box, locate the dropdown menus 'X Field' and 'Y Field'. Change the X Field to 'UTM_E' and change the Y Field to 'UTM_N'. (1)(Figure 4.2)

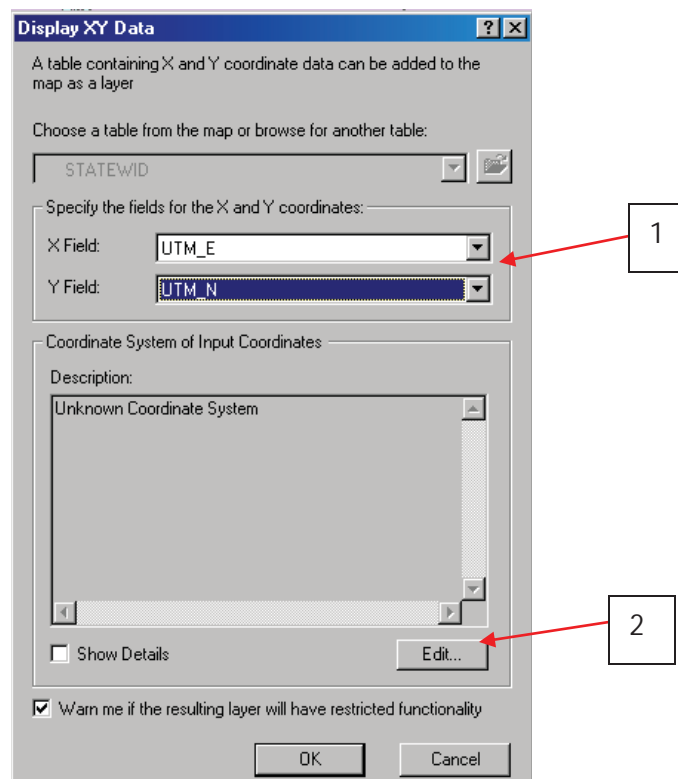


Figure 4.2

- c. Now, with the X and Y Fields appropriately selected, click 'Edit' (2)(Figure 4.2) under the Coordinate System of Input Coordinates section to apply a Coordinate System.
- d. In the Spatial Reference Properties box (Figure 4.3), choose Select (1) to proceed to navigate to the correct Coordinate System.

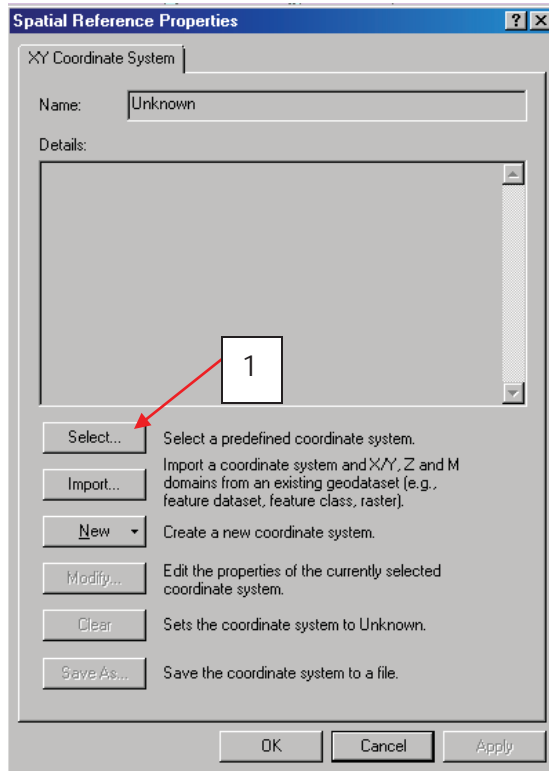


Figure 4.3

- e. In the Browse for Coordinate System box (Figure 4.4), navigate to: **Projected Coordinate System\Utm\NAD 1983** and select NAD 1983 UTM ZONE 15n.prj and click Add.

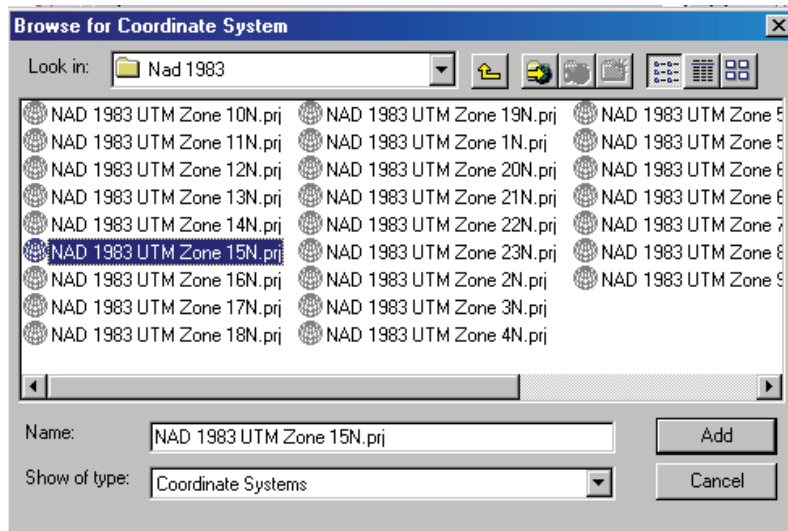



Figure 4.4

- f. Apply the changes and select OK. Select OK in the Display XY Data box. The database data is now portrayed through point shapefiles in ArcMap. The newly created point data is listed as 'STATEWID Events' in the table of contents.

5. Now, with the STATEWID Events data, points can be selected using the Select Features tool . Using the Select Features tool, select a point of interest. (Be sure that it is highlighted after clicking) (Figure 5.1)

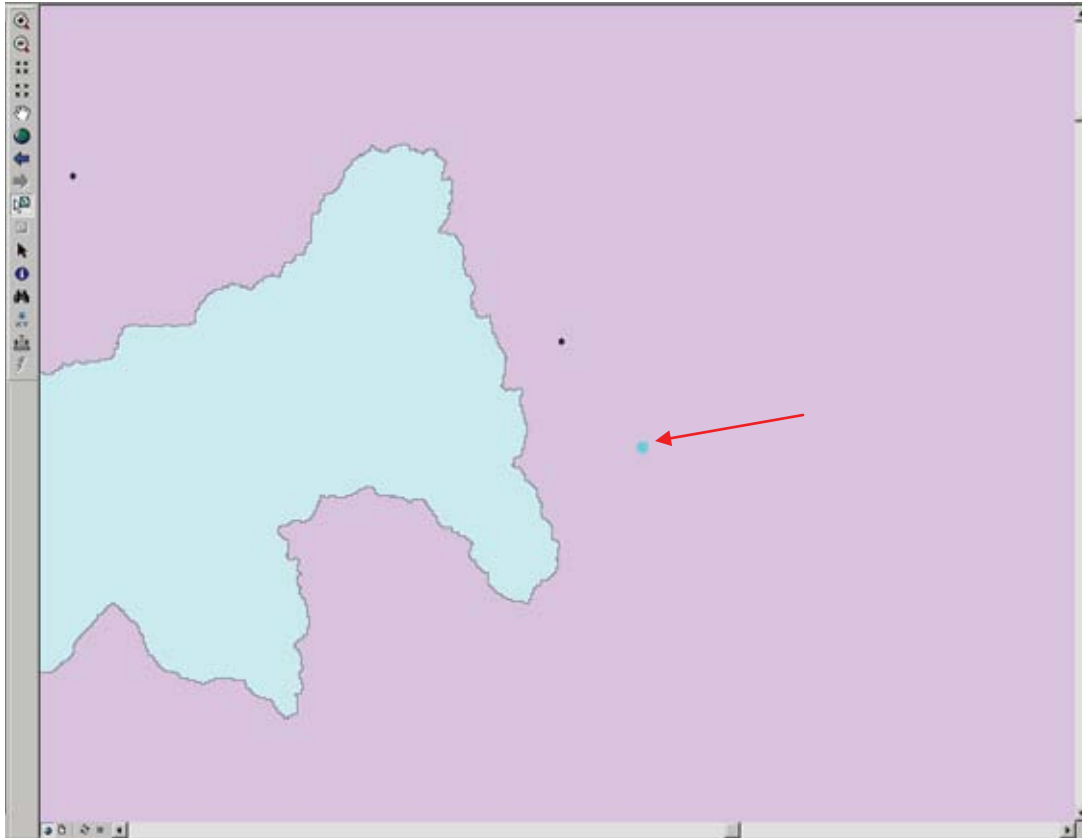


Figure 5.1

- a. With a point feature highlighted, right click STATEWID Events in the table of contents and select 'Open Attribute Table'. (Figure 5.2)

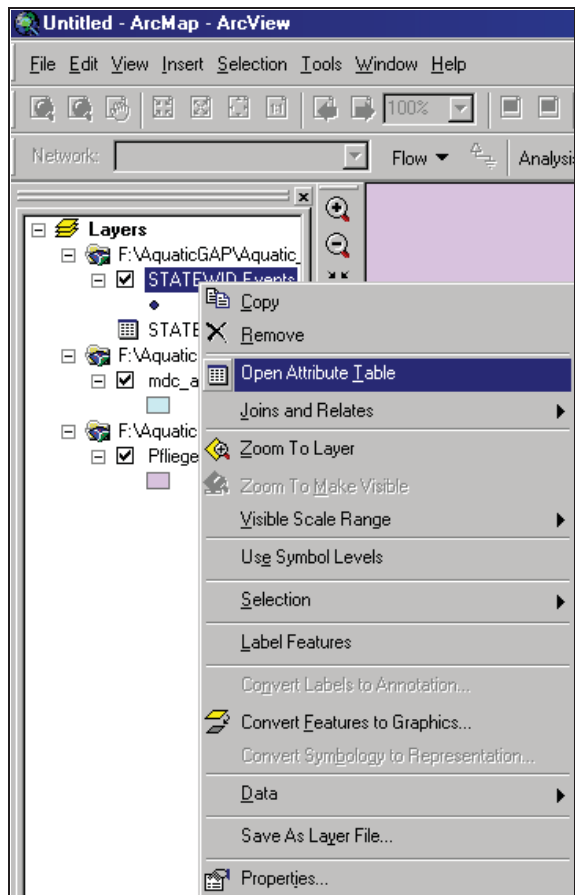


Figure 5.2

- b. In the STATEWID Events Attribute Table (Figure 5.3), click Selected (1) at the bottom to display all of the Attributes associated with the selected point.

Selected Attributes of STATEWID Events									
OID	COLL_ID	COMMON_NAM	SCIENTIFIC	NUMBER	WATERBODY	SITE_NAME	LOCALITY	UTM_E	UTM_N
5935	3601	STRIPED SHINER X BLEEDING SHINER	LUXILUS CHRYSOCEPHALUS X LUXILUS ZONATUS	1	BEAVER CR			563076	4127491
59353	3601	SOUTHERN REDEBELLY DACE	PHOXINUS ERYTHROGASTER	2	BEAVER CR			563076	4127491
59354	3601	RAINBOW DARTER	ETHEOSTOMA CAERULEUM	280	BEAVER CR			563076	4127491
59355	3601	STIPPLED DARTER	ETHEOSTOMA PUNCTULATUM	1	BEAVER CR			563076	4127491
59356	3601	STRIPED FANTAIL DARTER	ETHEOSTOMA FLABELLARE LINEOLATUM	37	BEAVER CR			563076	4127491
59357	3601	GREENSIDE DARTER	ETHEOSTOMA BLENNIODES	4	BEAVER CR			563076	4127491
59358	3601	LONGEAR SUNFISH	LEPOMIS MEGALOTIS	2	BEAVER CR			563076	4127491
59359	3601	HORNHEAD CHUB	NOCOMIS BIGUTTATUS	7	BEAVER CR			563076	4127491
59360	3601	BANDED SCULPIN	COTTUS CAROLINAE	2	BEAVER CR			563076	4127491
59361	3601	NORTHERN ORANGE THROAT DARTER	ETHEOSTOMA SPECTABILE SPECTABILE	207	BEAVER CR			563076	4127491
59362	3601	NORTHERN STURGEON	FUNDULUS CATENATUS	29	BEAVER CR			563076	4127491
59363	3601	CENTRAL STONE ROLLER	CAMPOTOMA ANOMALUM PULLUM	19	BEAVER CR			563076	4127491
59364	3601	LARGESCALE STONE ROLLER	CAMPOTOMA OLIGOLEPIS	32	BEAVER CR			563076	4127491
59365	3601	OZARK MINNOW	NOTROPIS NUBILUS	17	BEAVER CR			563076	4127491
59366	3601	BLEEDING SHINER	LUXILUS ZONATUS	441	BEAVER CR			563076	4127491
59367	3601	CREEK CHUB	SEMOTILUS ATROMACULATUS	1	BEAVER CR			563076	4127491
59368	3601	SCULPIN SP.	COTTUS SP.	13	BEAVER CR			563076	4127491
59369	3601	STRIPED SHINER	LUXILUS CHRYSOCEPHALUS	11	BEAVER CR			563076	4127491
59370	3602	BIG EYE SHINER	NOTROPIS BOOPS	2	BEAVER CR			563076	4127491
59371	3602	RAINBOW DARTER	ETHEOSTOMA CAERULEUM	23	BEAVER CR			563076	4127491
59372	3602	STRIPED FANTAIL DARTER	ETHEOSTOMA FLABELLARE LINEOLATUM	2	BEAVER CR			563076	4127491
59373	3602	GREENSIDE DARTER	ETHEOSTOMA BLENNIODES	1	BEAVER CR			563076	4127491
59374	3602	LONGEAR SUNFISH	LEPOMIS MEGALOTIS	19	BEAVER CR			563076	4127491
59375	3602	NORTHERN ORANGE THROAT DARTER	ETHEOSTOMA SPECTABILE SPECTABILE	50	BEAVER CR			563076	4127491
59376	3602	BLACKSPOTTED TOPMINNOW	FUNDULUS OLIVACEOUS	3	BEAVER CR			563076	4127491
59377	3602	GREEN SUNFISH	LEPOMIS CYANELLUS	2	BEAVER CR			563076	4127491
59378	3602	BLEEDING SHINER	LUXILUS ZONATUS	205	BEAVER CR			563076	4127491
59379	3602	BLUEGILL	LEPOMIS MACROCHIRUS	10	BEAVER CR			563076	4127491
59380	3602	OZARK MINNOW	NOTROPIS NUBILUS	108	BEAVER CR			563076	4127491
59381	3602	STRIPED SHINER	LUXILUS CHRYSOCEPHALUS	11	BEAVER CR			563076	4127491

1

Record: ⏮ ⏪ ⏩ ⏭ ⏮ ⏪ ⏩ ⏭

Show: All Selected

Records (36 out of 85678 Selected)

Options

Figure 5.3

Guide sheet 7: Generic AOP Inventory

(An inventory sheet and database to use as a template if conducting AOP inventories in the watershed)

*Refer to Data Structure Layout to locate AOP Barrier Inventory.accdb

AOP INVENTORY & ASSESSMENT

SITE: Watershed: _____ Crossing or Barrier I.D. Number: _____

County: _____ Road Name: _____ Stream Name: _____

Legal Description: T _____ N; R _____ W; Sec _____ Date: ____ / ____ / ____

UTM Coordinates: N _____ E _____ (UTM NAD83, Zone 15N)

Water Elevation: Intermittent _____ Low _____ Normal _____ High _____

Name of crew taking measurements _____

STRUCTURE:

TYPE OF STRUCTURE:

- | | |
|--|---|
| <input type="checkbox"/> Gravel ford with no structure | <input type="checkbox"/> Concrete slab with one box culvert (with bottom) |
| <input type="checkbox"/> Bridge or clear span without bottom | <input type="checkbox"/> Concrete slab with multiple box culverts |
| <input type="checkbox"/> Concrete slab with NO culvert | <input type="checkbox"/> Concrete slab with wide box opening (no bottom) |
| <input type="checkbox"/> Concrete slab with one pipe culvert | <input type="checkbox"/> Dam _____ |
| <input type="checkbox"/> Concrete slab with multiple pipe culverts | <input type="checkbox"/> Other: _____ |

CONDITION INDICATORS: (circle all that apply within 50ft upstream and downstream of the structure; Note: LDB=Left Descending Bank, RDB=Right Descending Bank, up=Upstream, down=Downstream)

Eroding Banks: upLDB upRDB downLDB downRDB

Rip Rap: upLDB upRDB downLDB downRDB

Grouted Rip Rap: upLDB upRDB downLDB downRDB

Condition of Bridge: racked deck undermined footings downstream scour hole upstream sedimentation
other _____

Condition of Dam: breached completely partially breached completely intact
describe _____

Other: _____

Are the road approaches constricting the floodplain: YES NO

(Are they elevated off the floodplain significantly without adequate conveyance underneath?)

STRUCTURE DIMENSIONS/POSITION: (English units, to the nearest 1/4 foot) (check all that apply)

Width: _____

Length: _____

Skew Description:

(Driving Deck)

(High Bank to High Bank)

(Sketch Area)

☐ Perpendicular to channel

☐ Angled to channel

☐ Curved upstream

☐ Curved downstream

☐ RDB approach upstream

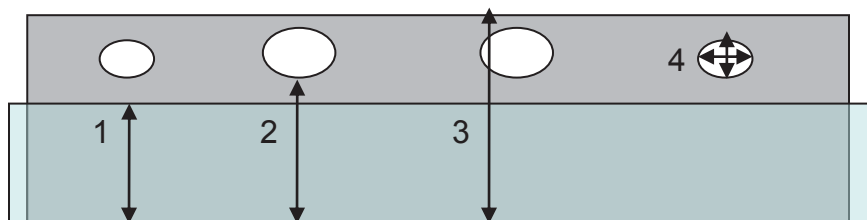
☐ RDB approach downstream

☐ Other _____

At Each UPSTREAM Opening Measure:

(Fill out chart measurements from **LDB to RDB**; English units to the nearest 1/10 inch)

(See numbered graphic for reference) (Note: if there are no openings, only measure #'s 1 and 3 at lowest point on deck up and downstream)



1. Water Depth (channel bottom to water surface)						
2. Opening Perch (channel bottom to bottom of opening)						
3. Height of Bridge or Dam (channel bottom to top of deck)						
4. Size of Each Opening (round-diameter, other-L and W)						
Opening blockage (% plugged by sediment: 0-25, 25-50, 50-75, 75-100)						

At Each DOWNSTREAM Opening Measure:

(Fill out chart measurements from **LDB to RDB**; English units to the nearest 1/10 inch)

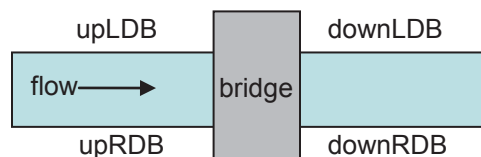
1. Water Depth (channel bottom to water surface)						
2. Opening Perch (channel bottom to bottom of opening)						
3. Height of Bridge or Dam (channel bottom to top of deck)						
4. Size of Each Opening (round-diameter, other-L and W)						
Opening blockage (% plugged by sediment: 0-25, 25-50, 50-75, 75-100)						

(Take all five measurements at each opening, and at both the upstream and downstream side of crossing)

PICTURE POINTS for Crossings:**Picture I.D. Number**

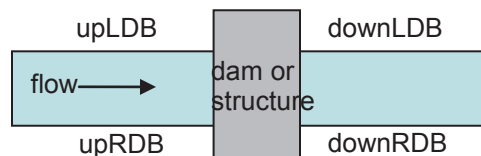
From:

1. Center of bridge deck upstream _____
2. Center of bridge deck downstream _____
3. Upstream bank to upstream face of bridge _____
4. Downstream bank to downstream face of bridge _____
5. Deck approach along upstream side of deck _____
6. Deck approach along downstream side of deck _____

**PICTURE POINTS for Dam or other:****Picture I.D. Number**

From:

1. Center of structure upstream (if possible) _____
2. Center of structure downstream (if possible) _____
3. Upstream bank to upstream face of structure _____
4. Downstream bank to downstream face of structure _____
5. Stream bank beside structure along upstream side _____
6. Stream bank beside structure along downstream side _____

**OTHER COMMENTS:**

Date form was entered in database ____ \ ____ \ ____


(Data forms should be entered in AOP Barrier Inventory Database and marked to show when entered, once the database is used, rename according to project or watershed and save back to drive. The generic database for entry is located at XHD\GIS\2010 ApC apps\Databases\AOP Barrier Inventory.acddb)

Guide sheet 8:

Calculating Total Predicted, Targeted Species, and Human Stress Index by AES

Calculating Total Predicted, Targeted Species, and Human Stress Index by AES

1. Open a blank ArcMap document.

- a. Using the Add Data Tool, , navigate to:
(XHD:\GIS\AquaticGAP\Aquatic_Data\Biological\Modeled_Data\Species_Counts)
and click and add the *AESCNTM.dbf* file. (Figure 1-1) This file will help find the number of species in the AES.

****Note:** The following navigation route is to a database that can also be used in this exercise, substituting for the *AESCNTM.dbf***

(XHD:\GIS\AquaticGAP\Human Disturbance\AES Stressor Data) ---
AES_HIS_metrics_index.dbf. This file tells you individual stressor metrics and overall Human Stress Index for the AES.



Figure 1-1

- b. The Mo_AES shapefile will also need to be added. Navigate to:
(XHD:\GIS\AquaticGAP\Aquatic_Data\Ecological_Classification\Aquatic_ECS) and click and add the *Mo_AES.shp* file. (Figure 1-2)

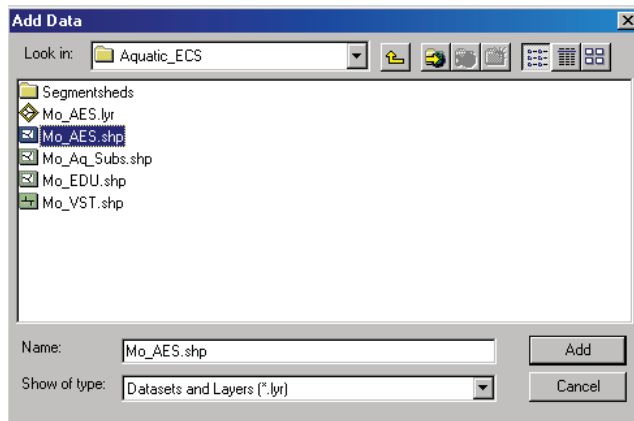


Figure 1-2

2. Joining Mo_AES.shp and AESCNTM.dbf files.

- a. With both Mo_AES and AESCNTM added to the ArcMap table of contents, the two can be joined to spatially represent figures from the database.

*Before proceeding, make sure that 'Source' tab is selected in the table of contents.

(1) (Figure 2-1)

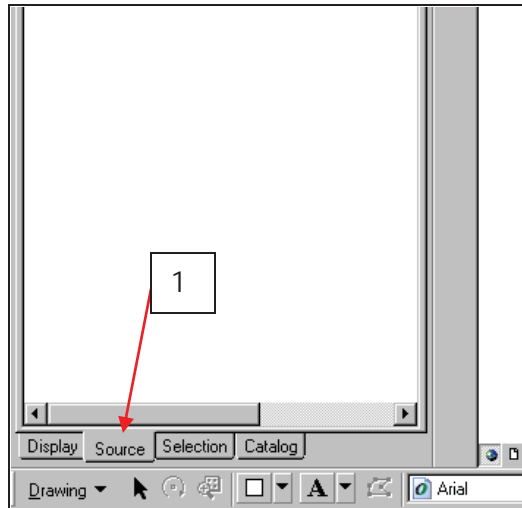


Figure 2-1

- b. In the ArcMap table of contents, right click Mo_AES and select 'Joins and Relates' > 'Join'. (Figure 2-2)

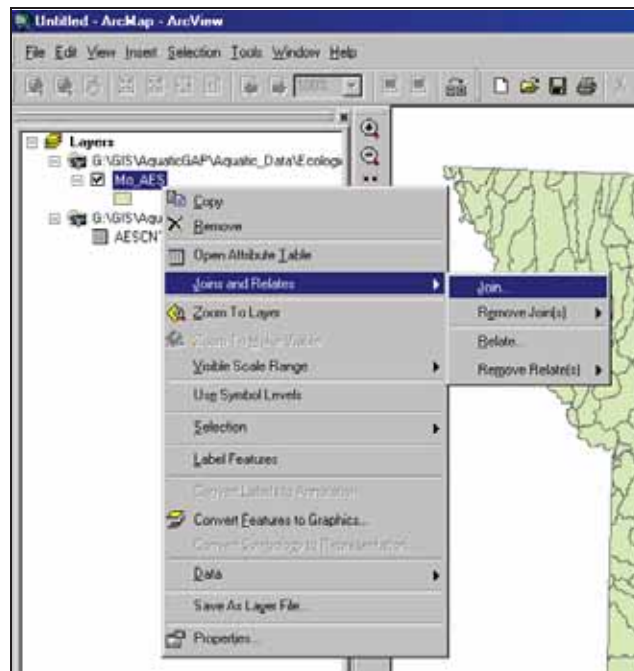


Figure 2-2

- c. In the Join Data menu, select the following: (Figure 2-3)
- Drop-down '1.' Select 'AESPOLYID'
 - Drop-down '2.' Select 'AESCNTM'
 - Drop-down '3.' Select 'AESPOLYID'
- Select OK.

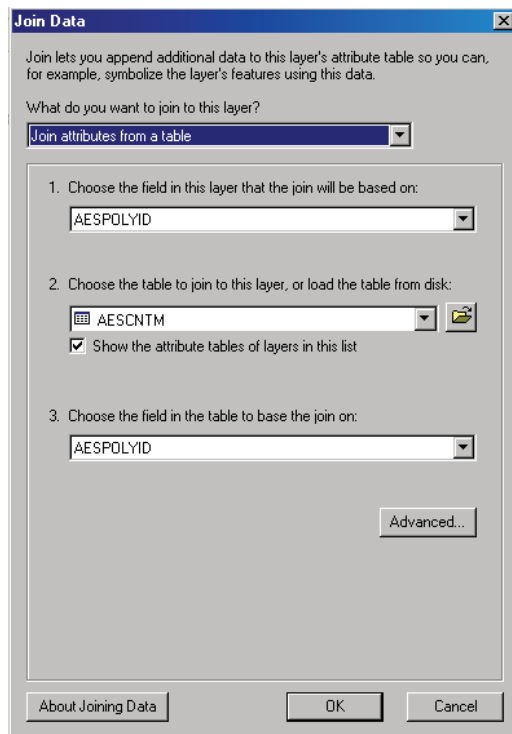


Figure 2-3

3. With Mo_AES and AESCNTM joined, you can use the Select Features button (1) to select an area polygon of choice (2). (Figure 3-1)

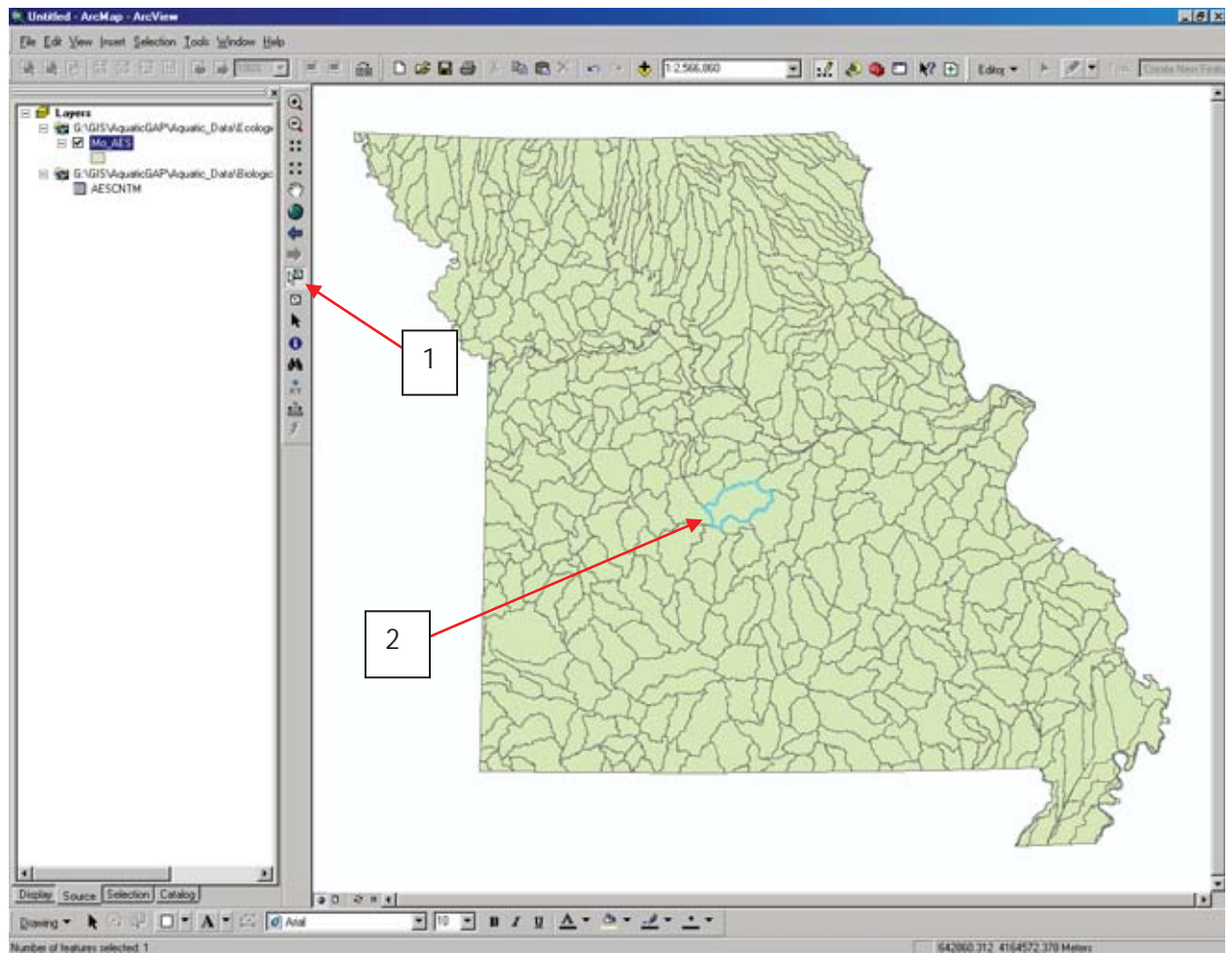


Figure 3-1

- a. Once an area has been selected, right click Mo_AES to 'Open Attribute Table'. In the attribute table, click selected (1) (Figure 3-2) and all attributes corresponding to the selected area should appear in highlighter color (2).

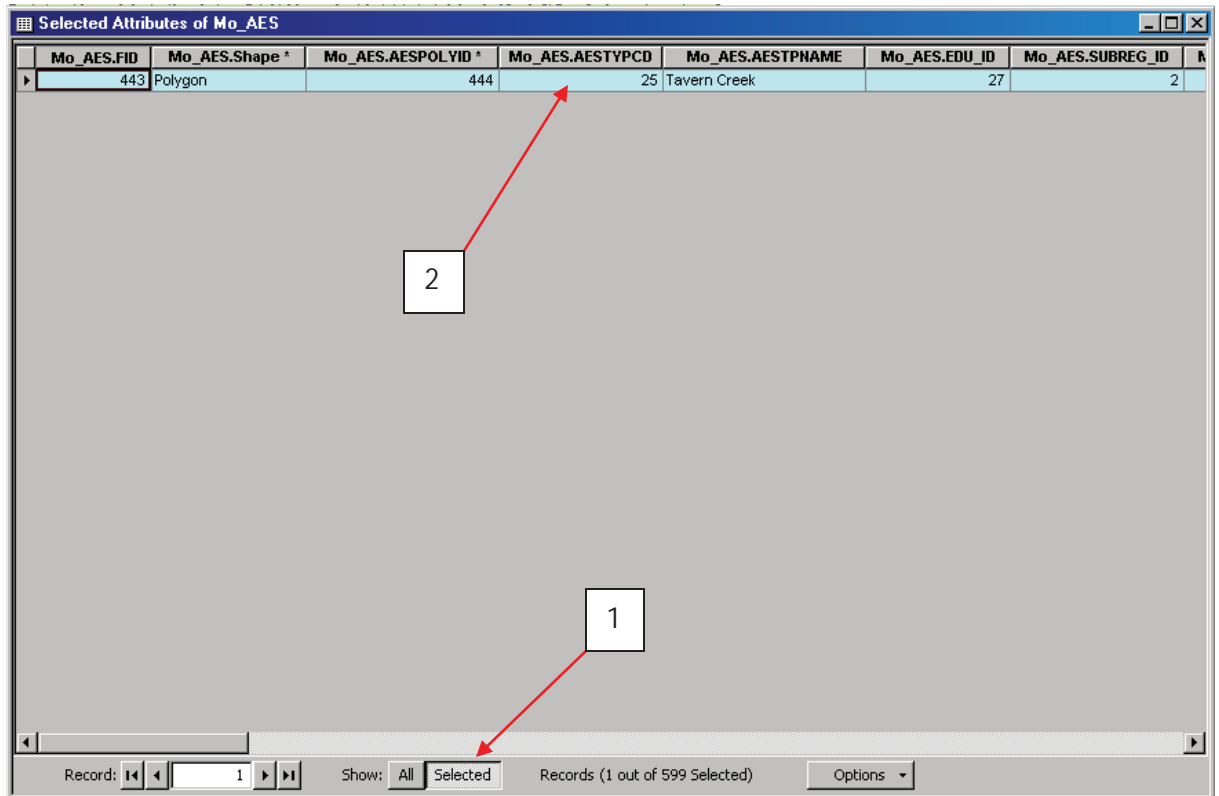


Figure 3-2

- b. Using the Attribute Table scroll bars, navigate to the **AESCNTM.FMC_CNT** (Total Species Count including fish, mussels, crayfish) and **AESCNTM.FMC_TGTCNT** (Target Species Count including fish, mussels, crayfish) fields (1) to specify desired data. (Figure 3-3)

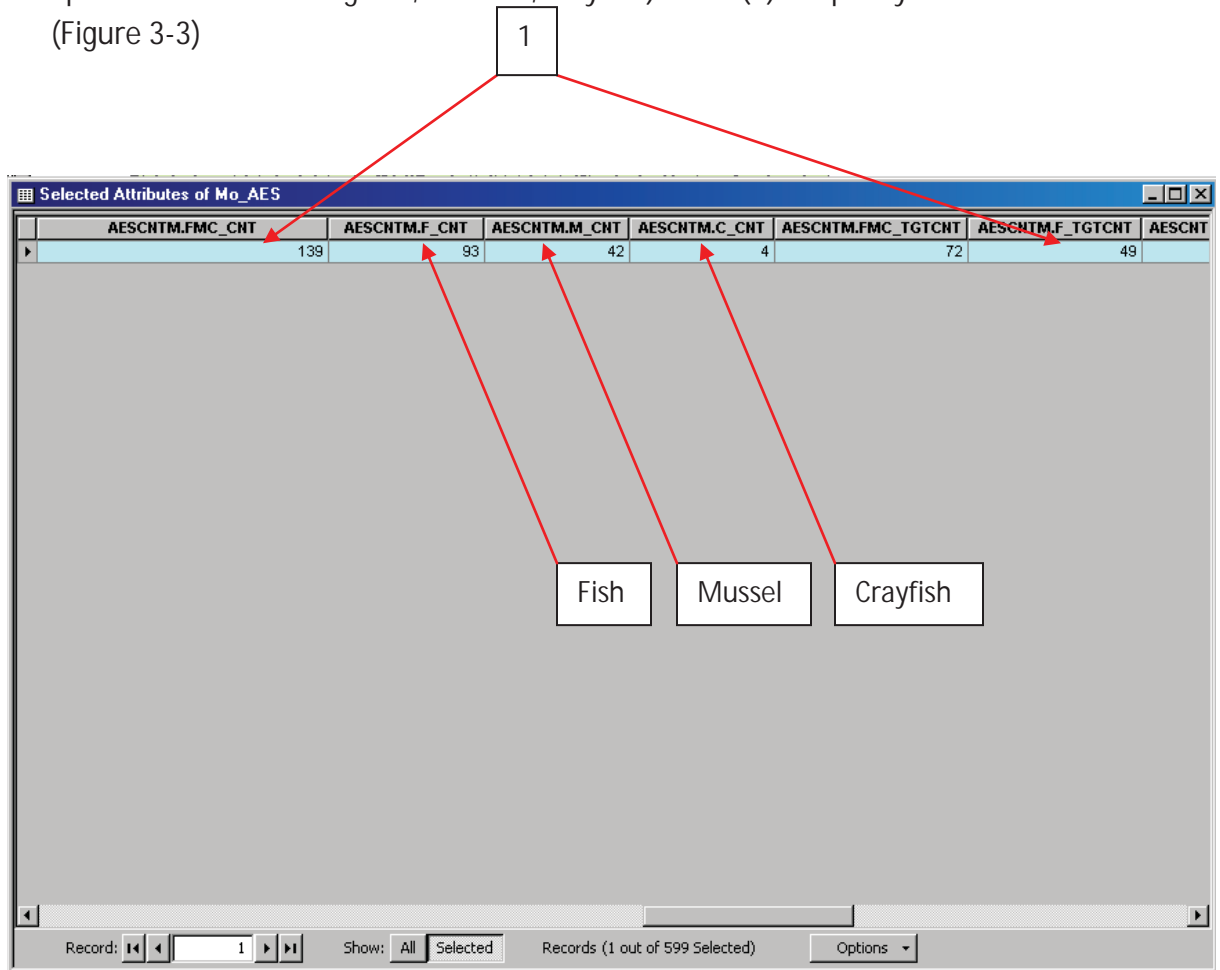


Figure 3-3

- c. You can also search for the AES instead of clicking on the polygon by selecting [in the attribute table] 'Options' > 'Select By Attributes' to open the Select By Attributes menu box and search for specific data. (Figure 3-4)

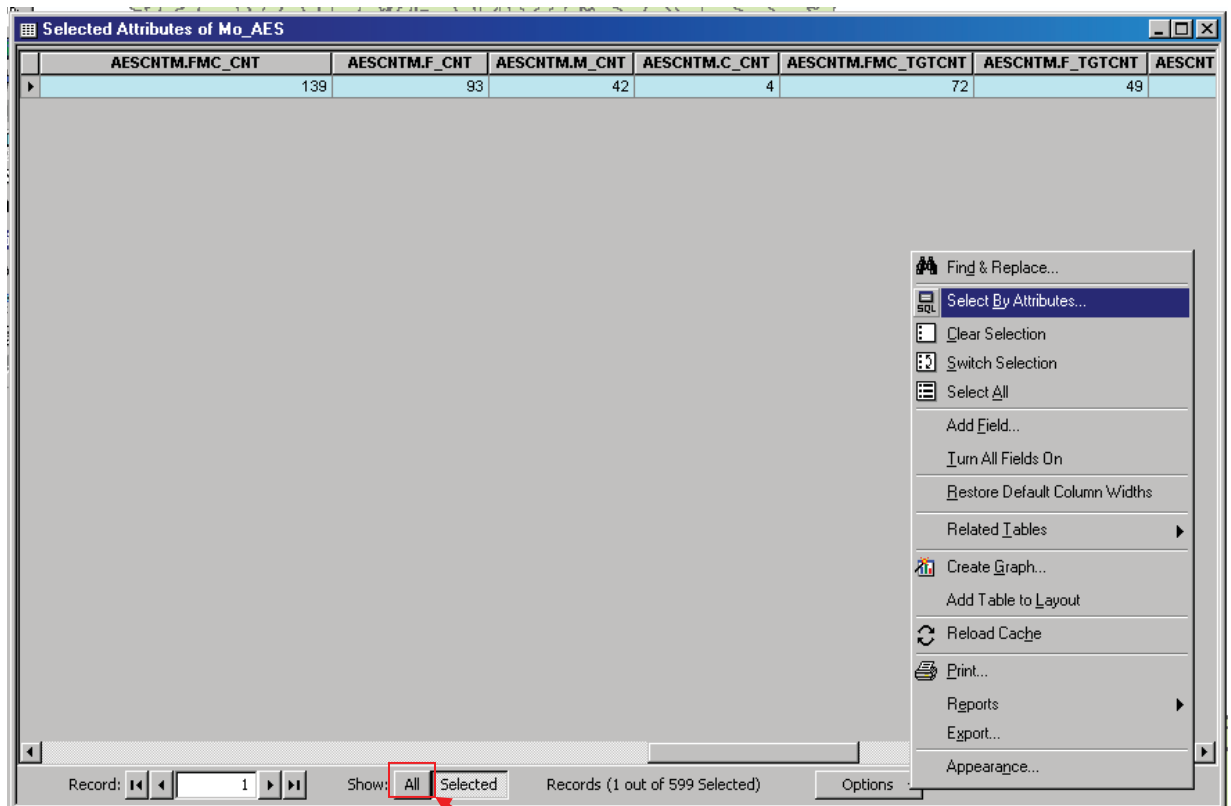


Figure 3-4


*When selecting by attributes, make sure to go back to 'Show: All' (1) (Figure 3-4) versus staying in "Selected" because the search will not utilize the entire attribute table possibly excluding some results.

Guide sheet 9:

Locating Irreplaceability Values

Locating Irreplaceability Values

Open a blank ArcMap document.

- a. Using the Add Data Tool, , navigate to:
(XHD:\GIS\AquaticGAP\Aquatic_Data\Conservation Priorities\MDC_COAs) and click and add the *mdc_aquatic_coa.shp* file. (Figure 1-1)

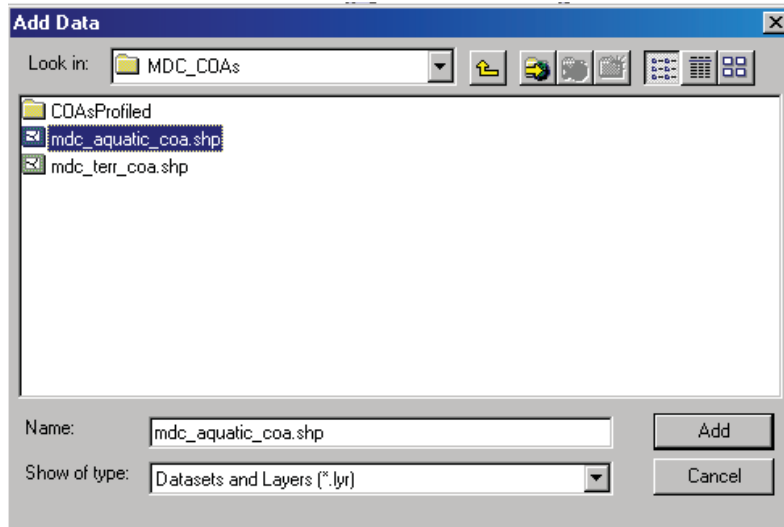


Figure 1-1

- b. The statewide_aquatic_irreplace.dbf file will also need to be added. Navigate to:
(XHD:\GIS\2010 Appendix C apps\Databases) and click and add the *statewide_aquatic_irreplace.dbf* file. (Figure 1-2)

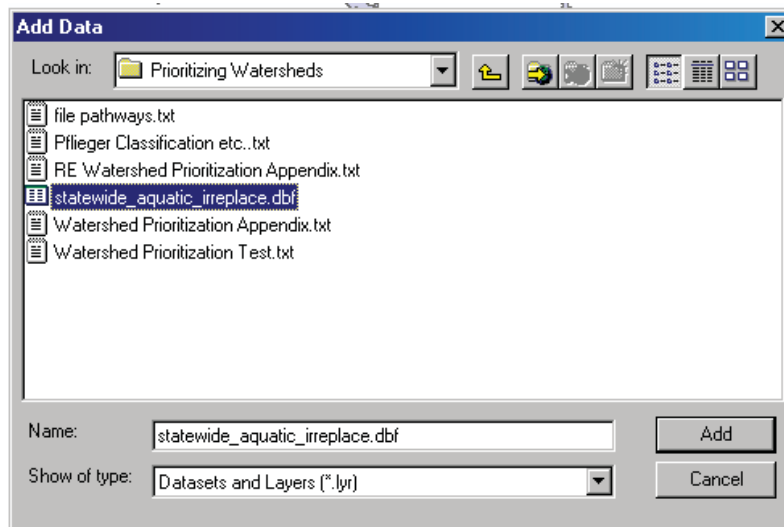


Figure 1-2

1. Joining mdc_aquatic_coa.shp and statewide_aquatic_irreplace.dbf files.
 - a. With both mdc_aquatic_coa and statewide_aquatic_irreplace added to the ArcMap table of contents, the two can be joined to spatially represent figures from the database.

*Before proceeding, make sure that 'Source' tab is selected in the table of contents.
(1) (Figure 2-1)

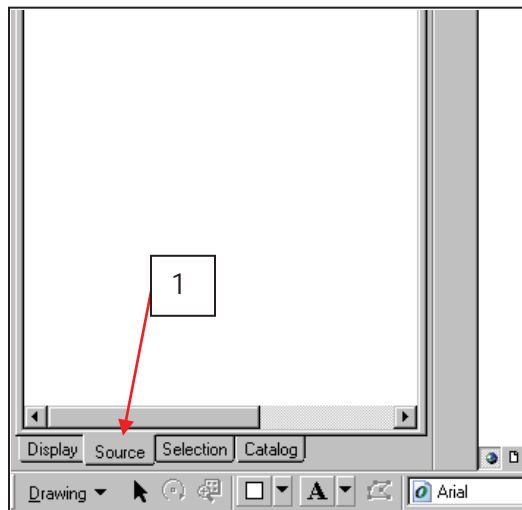


Figure 2-1

- b. In the ArcMap table of contents, right click mdc_aquatic_coa and select 'Joins and Relates' > 'Join'. (Figure 2-2)

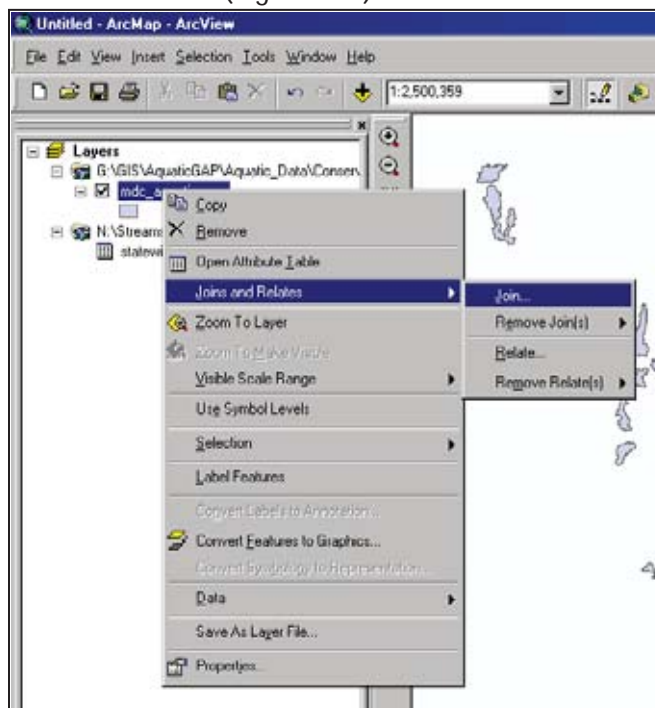


Figure 2-2

- c. In the Join Data menu, select the following: (Figure 2-3)
- Drop-down '1.' Select 'COA_ID'
 - Drop-down '2.' Select 'statewide_aquatic_irreplace'
 - Drop-down '3.' Select 'COA_ID'

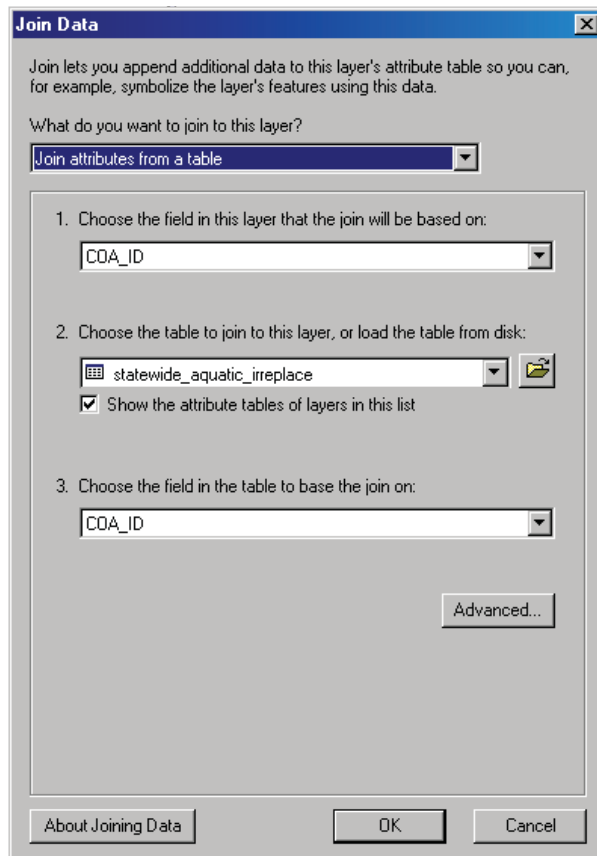


Figure 2-3

Select OK.

2. With mdc_aquatic_coa and statewide_aquatic_irreplace joined, you can use the Select Features button (1) to select an area polygon of choice (2). (Figure 3-1)

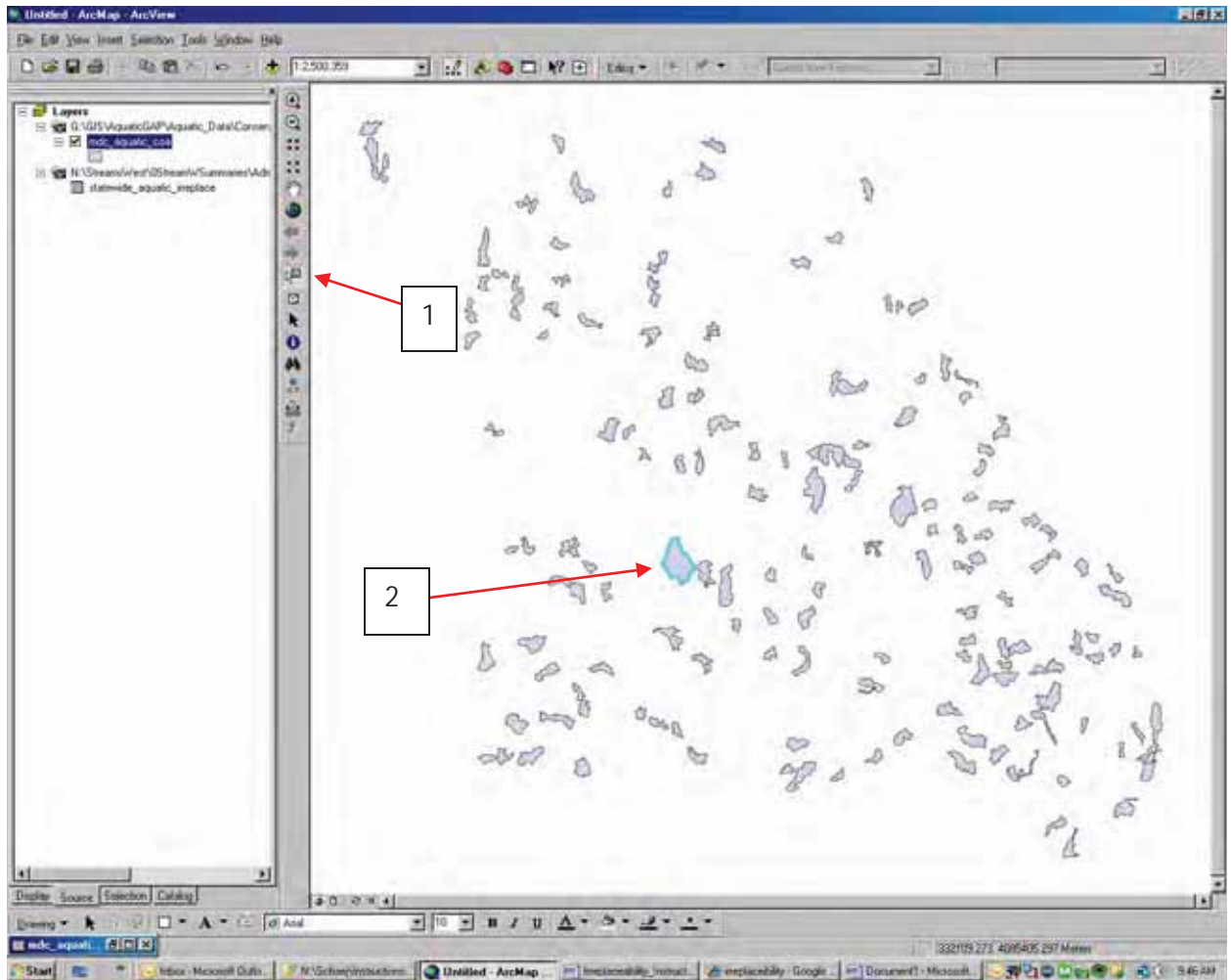


Figure 3-1

- a. Once an area has been selected, right click mdc_aquatic_coa to 'Open Attribute Table'. In the attribute table, click selected (1) (Figure 3-2) and all attributes corresponding to the selected area should appear in highlighter color (2).

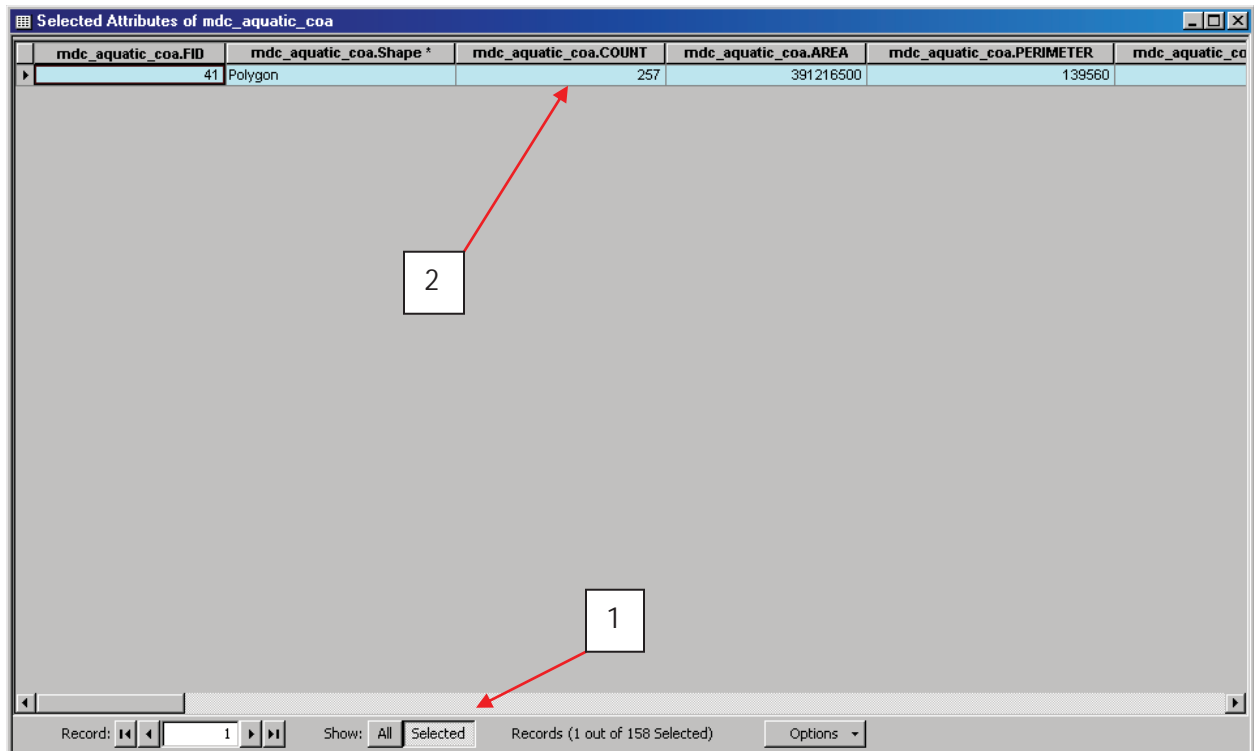
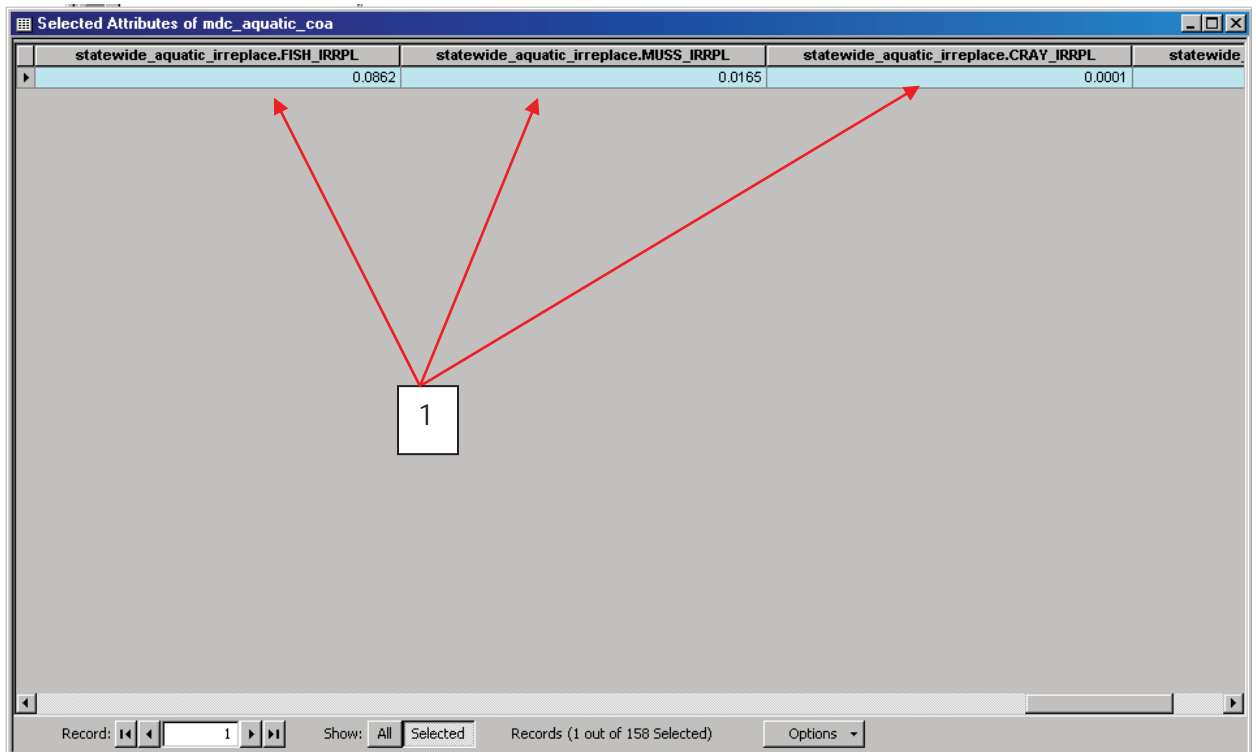


Figure 3-2

- b. Using the Attribute Table scroll bars, navigate to the statewide_aquatic_irreplace.FISH_IRRPL, statewide_aquatic_irreplace.MUSS_IRRPL, and statewide_aquatic_irreplace.CRAY_IRRPL fields (1) to specify desired data (Figure 3-3). See Appendix A for definition of irreplaceability values.



The screenshot shows a window titled "Selected Attributes of mdc_aquatic_coa". It contains a table with four columns. The first three columns are labeled "statewide_aquatic_irreplace.FISH_IRRPL", "statewide_aquatic_irreplace.MUSS_IRRPL", and "statewide_aquatic_irreplace.CRAY_IRRPL". The fourth column is labeled "statewide". The first row of data shows values 0.0862, 0.0165, and 0.0001 for the first three columns respectively. A box labeled "1" is positioned below the table, with three red arrows pointing from it to the first three columns of the table. The bottom of the window has a status bar with "Record: 1", "Show: All Selected", "Records (1 out of 158 Selected)", and an "Options" dropdown.

statewide_aquatic_irreplace.FISH_IRRPL	statewide_aquatic_irreplace.MUSS_IRRPL	statewide_aquatic_irreplace.CRAY_IRRPL	statewide
0.0862	0.0165	0.0001	

Figure 3-3

You can also search for the AES instead of clicking on the polygon by selecting [in the attribute table] 'Options' > 'Select By Attributes' to open the Select By Attributes menu box and search for specific data. (Figure 3-4)

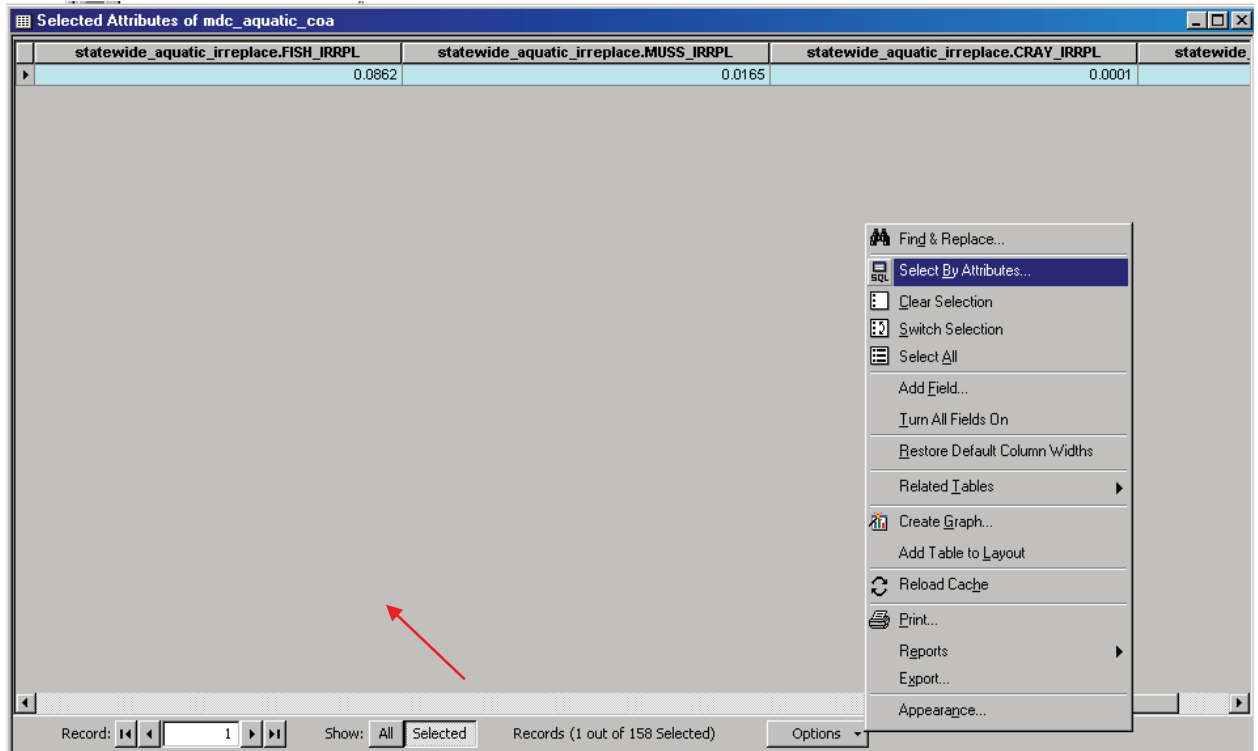


Figure 3-4

1

*When selecting by attributes, make sure to go back to 'Show: All' (1) (Figure 3-4) versus staying in "Selected" because the search will not utilize the entire attribute table possibly excluding some results.

Water Quality Databases

PROGRAM/DATA SOURCE	DESCRIPTION	LOCATION OR WEBLINK
Nation Wide		
National Ambient Water Quality Assessment (NAWQA)	The National Water-Quality Assessment Program (NAWQA) provides an understanding of water-quality conditions; whether conditions are getting better or worse over time; and how natural features and human activities affect those conditions. Regional and national assessments are possible because of a consistent study design and uniform methods of data collection and analysis. Monitoring data are integrated with geographic information on hydrological characteristics, land use, and other landscape features in models to extend water-quality understanding to unmonitored areas. Local, State, Tribal, and national stakeholders use NAWQA information to design and implement strategies for managing, protecting, and monitoring water resources in many different hydrologic and land-use settings across the Nation.	http://water.usgs.gov/nawqa/
National Water Information System (NWIS)	The United States Geological Survey (USGS) has collected water-resources data at approximately 1.5 million sites across the United States, Puerto Rico, and Guam. The types of data collected are varied, but generally fit into the broad categories of surface water and ground water. Surface-water data, such as gage height (stage) and streamflow (discharge), are collected at major rivers, lakes, and reservoirs. Ground-water data, such as water level, are collected at wells and springs. Water-quality data are available for both surface water and ground water. Examples of water-quality data collected are temperature, specific conductance, pH, nutrients, pesticides, and volatile organic compounds. This web site serves current and historical data. Data are retrieved by category of data, such as surface water, ground water, or water quality, and by geographic area. Subsequent pages allow further refinement by selecting specific information and by defining the output desired.	http://waterdata.usgs.gov/nwis
EPA's STORET	The STORET (short for STOrage and RETrieval) Data Warehouse is a repository for water quality, biological, and physical data and is used by state environmental agencies, EPA and other federal agencies, universities, private citizens, and many others.	http://www.epa.gov/storet/index.html
Missouri Specific		
MO RAP	Missouri Resource Assessment Partnership (MoRAP) develops, analyzes, and delivers the highest quality, lowest cost geospatial data for natural and cultural resource management. The partnership fosters innovation and cooperation among participants in order to improve our quality of life. Contains a variety of GIS data bases relevant to biological, hydrological and physical aspects of Missouri ecoregions	http://www.cerc.usgs.gov/morap/
DNR Impaired waters (303(d) list	The list of Missouri waters that are not meeting water quality standards as of 2008.	http://www.dnr.mo.gov/env/wpp/waterquality/303d/2008/proposed-2008-303d-list-pn.htm

Water Quality Databases

DNR 305(b) report on water quality of Missouri's streams and lakes	The Missouri Water Quality Report is published every two years. The report summarizes water quality issues and judges the degree of progress Missouri has made toward meeting Federal Clean Water Act goals. The water quality assessments made in this report will help direct future water quality management efforts to those waters most in need of restoration or protection.	http://www.dnr.mo.gov/env/wpp/waterquality/305b/index.html
DNR biological monitoring reports	Results of DNR biological investigations on water quality issues around the state.	http://www.dnr.mo.gov/env/esp/biologicalassessments.htm
MDC Crayfish Database	Describes the distribution of Missouri crayfish.	Currently developing electronic access: In interim contact MDC crayfish biologist at Resource Science Center (Bob DiStefano)
MDC Mussel Database	The mussel database is maintained by Steve McMurray and Scott Faiman. Data points contain the number of species found alive and the total # found, For species specific information contact Steve or Scott.	Currently developing electronic access: In interim contact MDC Mussel Biologist at Resource Science Center (Steve McMurray)
MDC Fish Database	The fish database is maintained by Doug Novinger. Data points contain information on the amount of time sampled, the gear used and the number of species divided into large fishes, nektonic fishes, benthic fishes.	Currently developing electronic access: In interim contact MDC Fish Biologist at Resource Science Center (Doug Novinger)
MDC Ram Database	The RAM database is maintained by Matt Combs. Data available for Washington County, Black River Watershed, Spring River Watershed, St. Francis Watershed and possible in the Big River Watershed.	Currently developing electronic access: In interim contact MDC RAM Coordinator (Matt Combes). Matt is located at the Kirksville Office.
MDC Contaminant Database	The contaminants database— This database has fish and other aquatic organism contaminant data from the early 1980s to the present. Most of the data are for fillet tissue. There is considerable data in the mined land areas.	Currently developing electronic access: In interim contact MDC Contaminant Biologist at Resource Science Center (Mike McKee)
MDC Fishkill Database	Location and description of fishkills that have occurred in Missouri over the past 30-40 years.	Currently developing electronic access: In interim contact MDC Pollution Biologist at Resource Science Center (Rebecca O'Hearn)
MDC Heritage Database	County level location data for Missouri species of concern.	http://www.mdc.mo.gov/cgi-bin/heritage/

The significant problems we face cannot be solved at the same level of thinking we were at when we created them. —Albert Einstein, in Cairns 1993

Turner, W.M. 1997. Achieving private-sector involvement and its implications for resource professionals. Pages 158-176 in J.E. Williams, C.A. Wood, and M.P. Dombeck, editors. Watershed restoration: principles and practices American Fisheries Society, Bethesda, MD.

ACHIEVING PRIVATE-SECTOR INVOLVEMENT AND ITS IMPLICATIONS FOR RESOURCE PROFESSIONALS

William M. Turner

Private-sector involvement is critical to broad-scale watershed protection and restoration. Of the watershed area in the United States, 71% is in nonfederal ownership. In many states, the percentage is much higher; 27 states have more than 95% of their watershed area in nonfederal ownership (Table 11.1). In those states that do have a high percentage of government-administered lands, private interest groups representing industry, recreation, and the environment exercise great influence in water and land use decisions.

Past and present actions of both government and private-sector decision makers have resulted in degraded watersheds and associated aquatic ecosystems in the United States. Successful watershed and riverine management will not occur until those who make decisions about water and land use for both privately owned and publicly-owned lands change their perspectives and actions. The opening epigram from Albert Einstein says it best, and to progress beyond our historic level of thinking, we must understand the past attitudes and actions that have created the problems and clearly focus on the changes needed for success.

The book title *Entering the Watershed* (Doppelt et al. 1993) aptly describes the current level to which aquatic ecosystem management has progressed. Fisheries management has evolved from stocking and harvest limits to water quality improvement, and now to watershed management. Traditional instream habitat enhancement and protection have led us to realize that riverine fisheries exist within the context of watersheds and thus are at the receiving end of these complex hydrologic systems. The new watershed perspective mandates that all elements of the system must be considered. Reaching this point culminates decades of land and water conservation, and it leads us into a holistic view of riverine ecosystem management (Leopold 1994; Willard and Kosmond 1995; Williams 1995).

An understanding of fluvial processes and a commitment to the restoration and protection of watersheds are paramount to the restoration and protection of riverine ecosystems (Kerr et al. 1983; Heede and Rinne 1990; Schlosser 1991; Bickford and Tisa 1992). Many past failures in river and stream management were actually failures in understanding the physical and biological dynamics of these systems (Kerr et al. 1983; Williams 1995).

This lack of understanding has allowed the narrowly focused "reach approach," or site-specific strategy, to proliferate and to direct efforts whether they were intended to restore, protect, or modify. By perceiving a reach (segment) of river as a unit unto itself, the reach approach inappropriately attempts to isolate that reach from the remainder of the system. The problems or opportunities identified within the reach are considered to occur independent of upstream or downstream influences. Conversely, practices within the subject reach are considered to have minimal impact on upstream and downstream reaches.

TABLE 11.1. Percentage of U.S. watershed acreages that are federally and nonfederally owned. (Data from USGSA 1990.)

State	Federally owned (%)	Nonfederally owned (%)
Northeast		
Connecticut	0.2	99.8
Maine	0.8	99.2
Massachusetts	1.3	98.7
New Hampshire	12.7	87.3
New Jersey	2.4	97.6
New York	0.7	9
Pennsylvania	2.1	97.9
Rhode Island	0.3	99.7
Vermont	6.0	94.0
Midwest		
Illinois	2.7	97.3
Indiana	1.7	98.3
Iowa	0.9	99.1
Kansas	0.8	99.2
Michigan	12.6	87.4
Minnesota	10.5	89.5
Missouri	4.7	95.3
Nebraska	1.4	98.6
North Dakota	4.2	95.8
Ohio	1.3	98.7
South Dakota	5.7	94.3
Wisconsin	10.1	89.9
South		
Alabama	3.3	96.7
Arkansas	8.2	91.8
Delaware	2.2	97.8
District of Columbia	26.3	73.7
Florida	9.0	91.0
Georgia	4.0	96.0
Kentucky	4.2	95.8
Louisiana	2.6	97.4
Maryland	2.8	97.2
Mississippi	4.3	95.7
North Carolina	6.3	93.7
Oklahoma	1.6	98.4
South Carolina	4.7	95.3
Tennessee	3.8	96.2
Texas	1.3	98.7
Virginia	6.0	94.0
West Virginia	6.7	93.3
West		
Alaska	67.9	32.1
Arizona	47.1	52.9
California	44.4	55.6
Colorado	36.2	63.8
Hawaii	15.5	84.5
Idaho	61.7	38.3
Montana	28.0	72.0
Nevada	82.7	17.3
New Mexico	33.1	66.9
Oregon	52.4	47.6
Utah	63.8	36.2
Washington	29.0	71.0
Wyoming	48.8	51.2
Total U.S.	28.6	71.4

The reach approach exhibits both a lack of understanding and a disregard for fluvial geomorphic processes (processes by which streams shape the land). This has resulted in decades of channel alteration, landscape modification, and installation

of ill-advised instream habitat improvement structures ((Brookes 1988; Frissell and Nawa 1992; Rosgen 1994). These efforts have often created many more problems than they have solved (Kerr and Schlosser 1978). In contrast, restoration and protection on the scale of an entire watershed is a rational strategy that considers cumulative impact, facilitates interdisciplinary and interagency coordination, and recognizes the vital role of the private sector (Willard and Kosmond 1995).

The question that looms before us is, "How?" In the face of heightened concern about private property rights, an unprecedented move to downsize federal natural resource agencies, and an antiregulatory climate within a sector of the national political structure, how do we solve such a monumental problem? *The answer lies within a partnership of private interests and public agencies.* The private sector is essential to achieving proper watershed management because members have a strong and vested interest. Motivated private individuals and organizations have the incentive to expend the effort to organize, gain political adoption of, and implement innovative management plans (Kusler 1995b). Only with a knowledgeable and empowered private sector, equipped with technical support from public agencies, will watershed restoration and protection be accomplished on a broad scale and far into the future.

The intent of this chapter is to outline ways to achieve constructive involvement by the private sector in watershed restoration and protection. The information presented is derived from other authors and 10 years of experience instituting and developing a statewide stream management program in Missouri (Wehnes 1992).

Discussion of the private sector can be facilitated by focusing on three groups: (1) the general public, (2) conservation advocacy groups, and (3) landowners. The majority of landowners upon which this chapter will concentrate are commodity producers. These include agricultural producers, miners, loggers, commercial fishers, and others who derive a living by extracting commodities from the watershed. Commodity producers are emphasized because of their history of affecting watersheds. Thomas (1985) reported that, in 6 of 10 U.S. Environmental Protection Agency regions, non point sources were the principle remaining cause of water quality problems, and agriculture was the most pervasive non point source in every region. The magnitude of landowner impact shows the important need for their involvement and the need to understand their role and contribution.

Direct decisions regarding water and land use are made by landowners. Indirect influence comes from the general public and conservation advocacy groups, who influence public opinion, legislation, and regulatory decisions. All three of these groups will continue to influence decision making, whether or not natural resource professionals interact with them. However, without resource professional interaction, decisions will be focused on social and economic priorities, and will not be adequately weighted with sound scientific information. Effective communication by knowledgeable resource professionals will positively affect decision making. In fact, the potential is great for resource professionals to be catalysts for enlightened strategies that will replace the status quo and result in healthier aquatic ecosystems.

FUNDAMENTALS OF THE WATERSHED STRATEGY

Effective protection and restoration are rooted in innovative projects and programs that are tailored to the hydrologic, social, and biological characteristics of the watershed. Projects and programs must be compatible with the existing decision making processes for water and land use within a watershed. These processes are often heavily influenced by multidisciplinary viewpoints, multiple political boundaries, tradition, and economic considerations. Because of the complexity of riverine and watershed management, guidance is needed to initiate and develop a successful program. Several published articles have included this type of guiding information: Mahood (1985), Heede and Rinne (1990), Wehnes (1992), Wise (1993), Ticknor (1994), Willard and Kosmond (1995), and Kusler (1995a, 1995b).

This information, plus the author's personal experience, has been used to compile 10 fundamental principles that need to be addressed to coordinate an effective watershed-based program.

1. Authority must be vested in local entities, with full representation of affected community members.
2. The political will to pursue riverine and watershed protection and restoration must be present, or it must be developed early in the project.
3. Many educational needs exist, and it is vital that they be identified, prioritized, and addressed.

4. Clear, well-developed goals should be established and a single authority (i.e., local committee, watershed board, agency) should lead the planning and management effort.
5. A watershed analysis should be conducted using the best available data.
6. Key stakeholders must be understood and their economic and social concerns addressed.
7. Programs and projects must have a strong scientific base that includes adequate trained staff.
8. Clear and frequent communication is needed among resource professionals, project stakeholders, and the general public.
9. Watershed projects should be user-friendly.
10. Project monitoring and evaluation should be ongoing and adjustments made as needed.

All 10 of these principles should be considered essential, and others should be identified case-by-case. There is no significance to the order of the following principles; the order should be determined for each situation.

Principle 1. Authority Must Be Vested in Local Entities

The watershed strategy should be based on the premise that one key to success is to involve local people in setting policy and solving problems. "Local people solving local problems" is a common adage that describes this characteristic. Wehnes (1992), Kusler (1995a, 1995b), and Ticknor (1994) all stressed the need for local authority and full representation from the community. Achieving this level of local involvement will require a fundamental change in the approach used by most agencies.

Key to any program is the role of the administering organization, whether it is government or private. The administering organization generally acts as the ultimate authority and dictates the decision-making process. Based on the hierarchy of authority, programs are commonly categorized as either "topdown" or "bottom-up." For example, most programs based in the federal government are in the "top-down" category, because decisions are made at the higher levels of government. Although some authority to make decisions is delegated to state and local governments, the federal agency retains control. The more authority that is exercised from the "top," the less likely it is to be received favorably at the local level. This "top-down" strategy is suitable for programs with nationwide applications or resources of national interest, but it is poorly suited to addressing complex problems and opportunities at the local level.

In contrast, a "bottom-up" strategy focuses the decision making at the local level. This approach of "local people solving local problems" has been advocated by both government agencies and commodity producers. Speaking for the U.S. Environmental Protection Agency, Thomas (1985) stated that it is only at the state and local level that enough flexibility exists to make the site-specific and source-specific decisions required for success. On behalf of the livestock industry, Coy (1985) made two points in support of locally based programs. First, improved communication is needed among government, farmers, scientists, and the general public. Second, cooperative solutions should be emphasized over government dictum. Within the "bottom-up" strategy planning is conducted at the local level. This gives local people ownership in the plan, because it is a compilation of their ideas that fit their needs.

Upper levels of government do play important support and regulatory roles for a "bottom-up" program. They do so by providing technical assistance, costsharing programs, grants, and enforcement of state and federal laws (such as the Clean Water Act, the Endangered Species Act, and state environmental laws). The need for complementary federal programs that enable this approach should not be underestimated. The combination of such federal, state, and local efforts is the key to protecting the nations' river systems (Doppelt et al. 1993).

Events in the St. Louis River watershed in northern Minnesota illustrate citizen acceptance of local authority and rejection of a "top-down" strategy. The St. Louis River Board was formed in 1991 because of concern about the future of rivers in this watershed. The public, local government officials, and Fond du Lac tribal officials are represented on the board. The board was established specifically to formulate a comprehensive management plan for the wise use and environmental protection of the St. Louis River watershed (Hambrock and Murto 1993). The plan includes criteria for (1) protection of critical biological, historical, and archaeological resources, (2) recreational use of the river and adjacent lands, and (3) strong cooperative planning and management practices.

Ironically, 10 years earlier, the Minnesota Department of Natural Resources proposed a similar plan for a subbasin of the St. Louis River watershed. Although public input was sought, the Department's plan failed because it was perceived as state government interference in local affairs. In addition to the St. Louis River initiative, Minnesota has several examples of grassroots planning initiatives that now provide good resource protection (Pauley 1993).

The Watershed Committee of the Ozarks is another excellent example of a successful "bottom-up" strategy to addressing watershed needs. The committee is a nonprofit organization created by the citizens of Springfield, Missouri, to protect the drinking water supply of the Springfield-Greene County community. The committee includes citizens who represent the city, county, water utility, and the general public.

The Watershed Committee of the Ozarks reviews zoning laws, initiated development of a geographic information system for the area, and is the innovator of projects relating to nonpoint pollution, stormwater, and spring monitoring projects. The committee has addressed educational needs by developing a water resource library, developing a water-testing program in schools, hiring a communication specialist, and producing multimedia presentations. These are all accomplished with funding from local, state, and federal governments (Bullard 1994). Local authority, strong community representation, and the discriminate use of higher-level government expertise and funding are the important attributes that make this watershed program effective.

In contrast, the Locust Creek Riparian Corridor Management Plan, proposed for north-central Missouri, reminds us that all stakeholder groups need to perceive a need for a project. This was a joint federal, state, and county project funded by Section 319 of the Clean Water Act. The project was designed by government planners and technicians, with much input from a small group of landowners. It centered on cost-sharing for streambank stabilization and purchase of riparian corridor easements.

Although landowners were surveyed to determine their concerns and level of interest, they did not act as decision makers. These landowners had a poor understanding of fluvial systems and a low regard for the ability of healthy riparian areas to protect channel stability, floodplain agricultural fields, and water quality. As a result, they did not comprehend a need to protect riparian areas and had not committed themselves to the project. Although improvements could have been made in the project design process, negative landowner attitudes probably would have prevailed, had the project proceeded, which it did not (M. D. Lobb, Missouri Department of Conservation memorandum, 15 June, 1995). Situations such as this exemplify the importance of evaluating participant attitudes and desires at an early stage so the project's direction and level of effort can be adjusted.

Principle 2. Political Will Must be Developed

In many watershed issues, numerous individuals, groups, and government entities must commit their support before significant changes can occur. Without such political support, adversarial views will dominate decision making, and the initiative will either be terminated or significantly altered to render it politically acceptable. In either case, the resource will not receive protection or restoration benefits.

Sampson (1991) noted that solutions to environmental problems often represent as much political pain as the problem itself. In these cases, the politician has little incentive to support the solution, so no action is taken. The political path of least resistance is followed. This scenario supports the concept that citizens lead and politicians follow. Missouri's stream program views this concept in a positive manner by acknowledging that good law is crystallized public opinion. The logical extension of this thinking is that support for protecting and restoring the riverine resource must develop from the grass roots (Wehnes 1992). The presence of strong grassroots advocacy provides incentive for politicians and government agencies to play a positive role.

Natural resource professionals experienced in coordinating politically charged issues know that citizen advocacy is essential to achieving resource protection. The need for citizen advocates is accentuated because most resource professionals are employed by government agencies. As agency employees, their freedom to act fully as advocates for the resource is often impaired by politics and agency policy. This results in citizen mistrust and apprehension toward working with agency staff.

On the other hand, private citizens possess the freedom, and its associated powers, to advocate on behalf of environmental concerns. Citizens must be given a legitimate opportunity to become active participants in issues that often are intimidating. Citizens can be intimidated because they may not be confident in their understanding of the subject, or because they may be inexperienced with the political process. A strategy is needed to alleviate this intimidation and to empower citizens to assume the lead in protecting natural resources. It has been said that knowledge fosters understanding, understanding fosters concern, and concern fosters action. These concepts outline a basic strategy for involving citizens.

Through effective public awareness and by providing opportunities that facilitate citizen involvement, knowledge and understanding can be promoted. If knowledge and understanding are attained, concern and meaningful actions will follow. *How to Save a River* by Bolling (1994) is an excellent book that details the steps vital to organizing a river protection initiative. One chapter of the book is devoted to increasing awareness and involving people.

Fostering knowledge and understanding within the private sector is a formidable and critical task. It requires organization and ample staff capability. One effective method is a canvassing outreach program. This method has been very successful for the Citizens Campaign for the Environment in New York and Connecticut. Canvassing outreach uses volunteers to make one-on-one contact to deliver both verbal and written information. This program informs citizens of watershed issues and guides them on how to effectively communicate with policy makers.

In Suffolk County, New York, outreach canvassing made the public aware of the long-term environmental and economic benefits of comprehensive watershed protection. This led to approval of several legislative initiatives. Outreach canvassing had similar success in the rural area near Albany, New York, and the watershed of Long Island Sound Estuary. This method targets citizens of a watershed in a personal way with information about that watershed. It is a sound marketing strategy.

Missouri's program also has identified objectives for increasing public awareness and citizen involvement. Citizen involvement has been accomplished with the state's Stream Team program. Stream Team is a formal joint venture of the Conservation Federation of Missouri, the Missouri Department of Conservation, and the Missouri Department of Natural Resources. Goals of the program are to educate, foster stewardship, and develop advocates.

Membership in Stream Team is open to all citizens, and in eight years it has grown to 940 teams, representing about 40,000 people. Growth has occurred without promotional campaigns, which is testimony to the latent environmental consciousness present in most of the country. Stream Team is a version of an adopt-a-stream program that aspires to move members beyond traditional cleanup projects and into resource advocacy. Members are asked to "adopt" a stream that interests them and are provided a Stream Team inventory booklet that guides them through a qualitative assessment as they canoe or walk their adopted stream.

This program has resulted in many benefits to the riverine resource: greenways have been established, harmful projects have been stopped, restoration projects have been conducted, and political activism has been exercised on key issues. A major accomplishment has been the formation of the Volunteer Water Quality Monitoring Program that trains Stream Team members to collect water quality data for the Department of Natural Resources. Six hundred individuals have been trained and are collecting data on 1,900 miles of stream (J. Bachant, Missouri Department of Conservation, personal communication).

This case history illustrates the potential advocacy strength that lies within the general public. It may be latent, but it is viable and represents opportunities for resource professionals to motivate citizens and to develop the political will that is needed to create positive change in watershed management.

Principle 3. Educational Needs Must be Identified and Addressed

Education is an essential component of effective riverine or watershed management. A basic understanding of the scientific processes affecting these ecosystems is essential to a good understanding of a watershed. Common areas of scientific information required are hydrology, fluvial processes, and biota (Williams et al. 1997a, this volume). However,

just as important for an accurate perspective is economic, social, and political information (Preister and Kent 1997, this volume).

In many cases, disseminating such information raises the awareness necessary to develop needed political support. For water and land users, this is often the first information that permits understanding of the impact of their actions on the resource. This basic understanding raises the environmental consciousness of these groups. It helps them to understand *best management practice*, which is the most effective and practical method of preventing or reducing pollution generated by a specific source. Early education can establish the rationale for a best management practice, and it can provide an opportunity for local people to evaluate proposed best management practices and to develop their own ideas. Often, it is the responsibility of participating resource professionals to assess the educational needs of an issue and to coordinate appropriate training. Meeting these educational needs in a timely manner will facilitate the entire process.

A case in point is Missouri's attempt to provide better resource protection against instream gravel mining. The ad hoc group formed to develop new regulations included representatives from regulatory agencies, regulated agencies, the mining industry, private conservation groups, and the Missouri Department of Conservation. Coordination activities soon revealed the need to raise the awareness of gravel mining impact, fluvial processes, and regulatory options.

Groups targeted for awareness efforts were agency representatives and their administrators, industry representatives, and private conservation group members. Each was provided similar information, but the content and presentation method were tailored to each group. This garnered administrative support and reduced contention by neutralizing many issues that were based on misconceptions and false information. Clearing the politically charged atmosphere of misconceptions is a positive step toward reaching a solution.

The physical and biological aspects of fluvial systems are challenging subjects to teach. One reason is that very few people, including resource professionals and engineers, have been exposed to these subjects. The absence of formal instruction leaves a void that is typically filled with misconceptions and false information. Teaching must dispel these erroneous, preconceived ideas and communicate correct information.

A second reason that the aspects of fluvial systems are hard to teach is that many hydraulic, hydrologic, and fluvial geomorphic principles are complex and difficult to grasp. For example, many people do not understand that a channelization project may increase upstream channel instability by increasing stream energy. The ability to understand such concepts is important to gaining public support necessary to restore watersheds.

Innovative methods of communicating complex information need to be used. The use of functioning models that simulate fluvial processes are invaluable teaching tools, because they hold students' attention and transfer the information better. Guy and Denson-Guy (1995) presented the four sensory modalities used in the learning process: visual, auditory, tactile (touch), and kinesthetic (movement). Research has shown that each individual uses all four but is best suited to use one modality. An advantage of functioning models is that they can be used in a format that presents the information in all four modalities, which should improve the educational experience for all. Such models increase the instructor's ability to communicate. Examples of good working models are the model stream (Gough et al. 1990), the Streamlab hydraulic demonstration flume (Newbury 1994), and the sand tank groundwater model (Meichenich 1990).

The model stream (Figure 11.1) is a rectangular water-tight box set at a desired slope and filled with a specific mix of granulated plastic. A stream channel is formed in the plastic substrate, and water is circulated to the head of the model stream. Basic principles of fluvial channels can be demonstrated. This model has proven to be effective with people from many disciplines, age groups, and educational backgrounds. It has been an invaluable instructional tool in critical issues such as channelization, instream gravel mining, and riparian corridor protection.

The Streamlab hydraulic demonstration flume (Figure 11.2) is a miniature flume whose image is projected onto a standard screen with an overhead projector. It is a good instructional tool for demonstrating the varied flow patterns associated with different structures in rivers and streams.

The sand tank groundwater (Figure 11.3) is designed to teach characteristics, movement, and potential for contamination. A well developed functioning model will have an instruction manual and, preferably, an accompanying videotape to ensure that new concepts are communicated correctly.

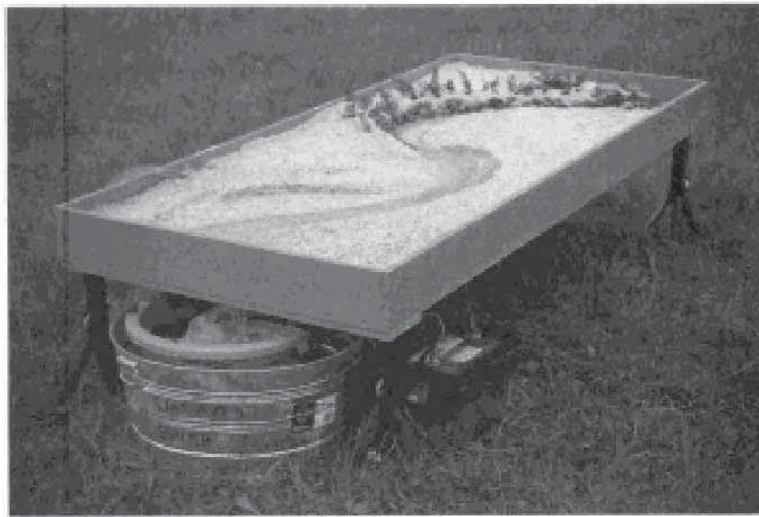


FIGURE 11.1 Model stream used to demonstrate the basic principles of stream channel formation and change.

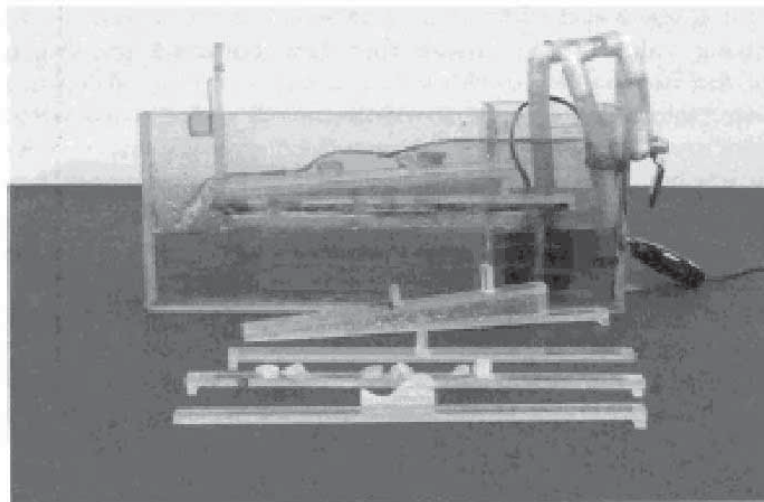


Figure 11.2 Hydraulic flume model used to demonstrate various streamflow patterns associated with in-channel structures.

Providing technical assistance in development and demonstration of best management practices is another important educational responsibility for resource professionals. This role must be recognized and accepted, because the impetus and expertise often are lacking in the private sector and some agencies to lead in providing technical assistance. Commodity producers often view the development and adoption of best management practices as a staffing and economic cost that will not provide timely economic return, if any. Skepticism over the severity of riverine and watershed problems, and any subsequent need for best management practices, also fosters apathy toward their development. However, if change from the status quo is advocated, then land and water users must have alternative practices that will ensure their economic stability and enhance the resource.

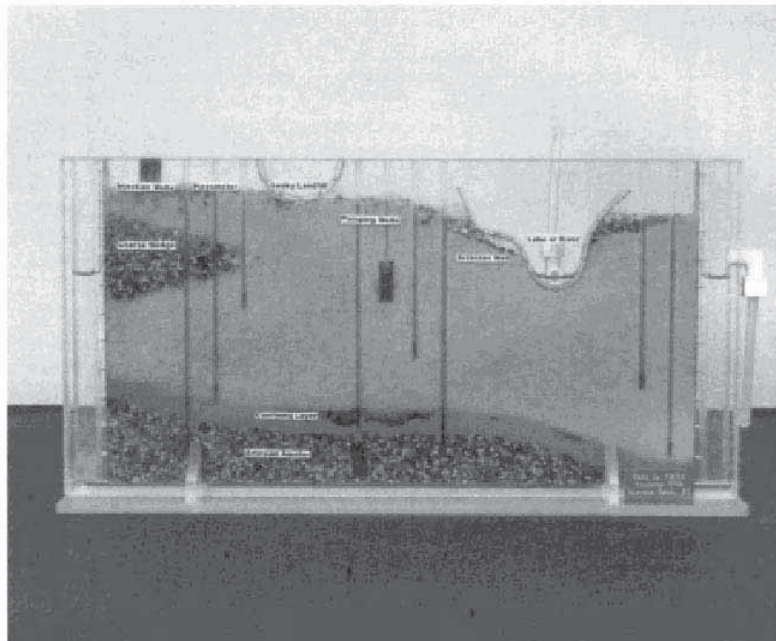


FIGURE 11.3. Sand tank groundwater model used to demonstrate changes in groundwater aquifers and potential contamination by chemical pollutants.

Ideally, best management practices should be developed very early in the riverine or watershed restoration and protection process. Although resource professionals must take the lead, commodity producers and other individuals expected to use these new practices must be closely involved with their development. Ownership in the development of new ideas will promote acceptance by their peers. Working with landowners, on their land, is an important facet of this approach. A well-conceived technical assistance strategy will address pertinent social and economic issues as part of the development and adoption process for best management practices.

The U.S. Natural Resource Conservation Service, formerly the Soil Conservation Service, has exercised this focus on obtaining local input and meeting local needs for many years (Helms 1993). Through this approach, the U.S. Natural Resource Conservation Service has had a strong influence on agricultural practices. The use of terraces, contour farming, and minimum tillage are all significant conservation practices that have been adopted by commodity producers and have increased long-term productivity and profitability. Chancy et al. (1990) described case histories of best management practices for riparian areas, demonstrated on lands in Oregon, Utah, Texas, South Dakota, Nevada, Idaho, and Arizona. These successes are similar, in that solutions were developed locally and proved to be advantageous for both stream health and for livestock producers.

Meeting educational needs does not ensure the adoption of watershed protection and restoration practices. However, ignoring these needs will assure the failure of such efforts.

Principle 4. Clear Goals Must be Developed

Well-developed goals should determine the spatial scale and approximate time line of the project. The scale could be a large watershed, or it could be approached subbasin by subbasin (Ziemer 1997, this volume). Working on a large scale may offer greater efficiency, but it also may preclude the flexibility required to develop site-specific and source-specific solutions. The time line must be realistic so that all participants have reasonable expectations for the time required to achieve expected results.

Setting goals also helps to define real problems, rather than just identifying symptoms that too often are the focus of habitat-improvement projects. A case in point is streambank instability. An eroding bank is often the focus of concern, but it is generally a symptom of a larger problem, such as vertical instability, alteration of the watershed's hydrology, or

physical removal of vegetation from the banks. A properly developed goal would address a problem like eroding banks within the broader context of their cause.

This does not imply that a symptom should never be addressed until the cause is identified and corrected. Sometimes the cause cannot be pinpointed, and the symptom (the eroding bank in this example) must be addressed. In other cases, the cause may be apparent, but incurable. A common example is hydrologic change and subsequent channel instability resulting from urbanization. In such cases, identifying the cause is still important because it provides information needed to properly design channel-stabilizing projects and to guide further urban development planning.

Agency resource professionals have important roles in goal development. They can supply technical information, organizational logistics, and support services in the early stages of a watershed project. This allows them to make important contributions while maintaining the position of an objective participant. (This is not meant to imply that the resource professional should attempt to be neutral on significant issues.) Once goals are established, they will guide the entire effort, so it is essential that the goals be developed with sound scientific input of resource professionals. Angermeier (1997, this volume) provides a conceptual framework that should be understood prior to establishing restoration goals for specific watersheds.

A single authority should take the lead in a watershed restoration or protection project. Leadership is essential to retaining organizational structure, continuity, and direction. The lead organization must have both the credibility and the resources to conduct the required tasks. A private organization should take this role, or a leadership group can be formed with representatives of the participating groups. A key characteristic of the lead authority is that it is committed to the full-watershed strategy of land and water management.

Principle 5. A Watershed Analysis Should be Conducted

Watershed analysis provides the essential information needed to write project goals. This basic analysis guides the goal-setting within the watershed context and prevents it from becoming too narrowly focused. Although the level of detail can vary greatly, some common types of information include geology, soil types and erosion hazards, channel development, hydrology, water quality, pollution sources, unique habitats, and biological community information. High-quality maps always are useful and often are critical.

Watershed analysis also provides continuity to information flow as the project progresses and as new participants join. Project documents provide an organized approach to problem identification and act as an educational tool for all interested parties. Ziemer (1997) summarizes the watershed analysis process, its intent, and critical components.

Principle 6. Concerns of Key Stakeholders Must be Understood

Agencies must clearly communicate their intent and have a good understanding of the concerns, perspectives, and capabilities of the stakeholders. Attaining this understanding is often difficult, because skepticism may exist between landowners and agency representatives. Landowners fear the loss of private property rights, and agency staff question the landowners' level of environmental concern and commitment. Such mutual distrust inhibits good communication. However, developing an understanding between these groups provides more accurate perspectives and establishes the credibility needed to produce positive results.

Conducting surveys is a good way for agency personnel to gain a better understanding of landowners. Surveys can be expensive and time-consuming, but they offer valuable insight on landowner perceptions of problems and potential solutions (Wehnes 1992). Surveys also provide basic information on gender, income, location, landowner status, and income commodity.

In central Iowa's Bear Creek watershed, Colletti et al. (1994) used a survey to assess perceptions of water quality, to identify uses of Bear Creek, to determine perceived sources of pollution, to identify conservation practices in use, and to determine the willingness of the watershed's residents to pay for water quality improvement. Survey results were intended

to help define best management practices that would be economically feasible, environmentally sound, politically expedient, and socially acceptable. Responses from farmers, absentee landowners, and nonfarmer groups were compared. A key factor in this survey was the use of farm leaders from within the watershed to review and refine the survey. Such a thorough, objective survey provides valuable insight into the attitudes of all watershed residents.

However, surveys are an impersonal contact, requesting substantial information from a cross section of watershed residents. Questions must be carefully worded to reduce biased answers and to reasonably avoid offending those surveyed. Nonrespondents to the survey should not be ignored, for they too are providing another sort of information input. Professional pollsters are recommended for survey development and data analysis.

Understanding the attitudes of watershed stakeholders is important. But it also is important to understand how they make decisions to change land and water use practices. This information can expedite development and adoption of best management practices. Rogers (1962) and Preister and Kent (1997) explain how innovative ideas are accepted into local communities. The diffusion of new ideas depends upon each individual's willingness to try new ideas. Categorizing community members according to their willingness to accept new ideas is called the diffusion model (Rogers 1962). The model consists of five categories: innovators, early adopters, early majority, late majority, and laggards. Although each category is specifically described, there is an assumed continuum among the five categories.

Innovators are critical to the diffusion process because they bring new ideas into the community. Key attributes of the innovator are the ability to apply complex technologies and to cope with a high degree of uncertainty. They also must have the financial resources needed to institute new ideas, and to absorb the loss if they do not work.

Early adopters are more closely identified with the majority, but they are open to new ideas. This position in the social system makes them influential in the widespread adoption of new ideas. Their primary role is to decrease the uncertainty about new ideas and to diffuse information within the community. Early adopters are sought by resource managers to speed the diffusion process.

Early majority group members follow with deliberate willingness, but seldom lead. Members of this group adopt new ideas just before the average member of society does, and they are an important link in the adoption network.

Late majority members are skeptics. They can be persuaded of the need for change, but peer pressure is needed to make them actually change. This group does not facilitate the adoption process.

Laggards are those who base their decisions on tradition, so they are generally the last to adopt new ideas.

An understanding of the inherent differences in how people adopt new ideas can be used to evaluate individuals for different roles in restoration. For example, those who are laggards or late majority members would not be good candidates for testing new best management practices.

Although useful, the diffusion model must be supplemented with knowledge and trust gained from frequent personal contact to fully understand those who will adopt innovations.

Hooks et al. (1983) pointed out that the diffusion model does not adequately consider economic constraints on decision making. The diffusion model implies that access to information is the major factor affecting adoption. It assumes that innovators and early adopters who are given a new idea will convey it to the rest of the community. However, farmers who lack adequate financial and land resources cannot adopt some ideas, regardless of their desire to do so. In addition, commodity producers are motivated to reduce cost and increase income. Thus, best management practices that are contrary to this primary objective will not be considered favorably. Misjudging the importance of economic factors is a common mistake of resource professionals, so economic constraints must be thoroughly evaluated and addressed.

Economic and social concerns of stakeholders, regardless of their background, must be acknowledged in an objective manner, accounted for whenever possible, and continually evaluated for probable effect on project success. Resource

professionals must use frequent personal contacts to build trust within the community, to understand citizen needs, and to gain widespread adoption of new ideas.

Principle 7. Programs and Projects Must Have a Strong Scientific Foundation

Establishing a technical base should precede all other activities of a riverine or watershed restoration project. The fact that good decision making is dependent upon good information dictates the need for a strong scientific base upon which to formulate watershed solutions. The best available information is needed regarding the extent of a problem, its cause, and its solution. Proceeding into a project without credible information jeopardizes the project's success because it causes confusion. This leads to participant insecurity and project failure. Credibility loss from scientific incompetence also makes subsequent projects more difficult to promote. A strong scientific base improves agency credibility, allows better understanding of problems, and sets the stage for making good decisions.

An acceptable level of scientific competency should be possessed by all staff members to ensure correct and consistent communication. An efficient method of providing a strong scientific base is through the use of interdisciplinary teams.

Principle 8. Clear and Frequent Communication

Many watershed stakeholders are unfamiliar with watershed issues and concepts. These must be introduced and reinforced regularly. Until familiarity is achieved, public support will be lacking. To achieve effective communication, information must travel in both directions, so resource professionals always should seek input from other participants.

Principle 9. Watershed Projects Should be User-Friendly

Realistically, the logistics of many watershed projects become the responsibility of a government agency and the resource professionals it employs. Tailoring the project to its users will reduce confusion and frustration and produce a positive attitude toward the project. Communicating clear project objectives, providing a streamlined process for permits, and reducing duplication among agencies also will ease frustration. To improve implementation, logistics should be coordinated with representative users.

Principle 10. Project Monitoring and Evaluation Should be Ongoing

Riverine and watershed projects are large and complex, making it difficult to stay focused and on schedule. However, flexibility is also important. The project must retain its focus on goals while being flexible with strategy. Continual monitoring and evaluation are needed to handle unexpected occurrences and to ensure project effectiveness (Kershner 1997, this volume). The evaluation process is facilitated by fully employing the other nine coordination principles because the project will be well-designed and frequent communication will have revealed areas of concern. The time line established during goal development should be adjusted as needed.

These 10 resource management coordination principles facilitate good planning based on sound scientific information, all of which is well-communicated throughout the project. Such projects are tailored to the needs of the watershed and offer greater potential than many traditional regulatory-based programs dictated by government agencies. However, the watershed strategy presents unique challenges that require resource professionals to evaluate their perspectives and priorities.

IMPLICATIONS TO RESOURCE PROFESSIONALS

Resource professionals are critical in watershed restoration and protection, but many of their roles are nontraditional. For example, fisheries biologists traditionally have focused on fish population dynamics, exploitation, and closely related management. Expanding those functions to encompass a watershed perspective greatly increases the complexity and alters the role of the position. Although the watershed strategy rationale is widely accepted, not all professionals willingly accept the changes required. Individuals having the aptitude and inherent attraction to riverine and watershed work should be recruited for these positions. Attempting to mold other aquatic professionals into these positions is a disservice to them and the resource.

The nontraditional roles induced by the watershed strategy often require expertise in hydrology, geomorphology, economics, water and land use disciplines, and social ecology. Meeting these requirements holds significant implications for resource professionals. The most fundamental challenge they face is the technical preparation to fulfill these functions. Willard and Kosmond (1995) point out that agencies often lack trained professionals who combine an interdisciplinary background with an interest in ecological restoration. Continuing education courses can provide the training, but resource professionals must promote the need for such training.

Beyond being technically prepared, resource professionals need to communicate their knowledge effectively. Significant challenges of public relations and communication are faced in presenting scientific information on watersheds to an audience as diverse---and often polarized---as watershed decision makers. Achieving effective communication requires resource professionals to seriously consider the steps needed to succeed. One option is for lead agencies to hire public relations consultants having rural and urban social science skills. They can help guide the planning process.

Carter (1992) clearly outlined the rationale for fisheries professionals to apply when evaluating communication techniques used in the past to promote watershed aquatic protection and restoration agendas. This experience is based on the 1985 Bay Restoration and Protection Plan and associated programs directed at the Chesapeake Bay and its watershed. Aquatic ecosystem protection cannot be achieved through plans developed solely by fisheries managers and select users. The lack of personal interaction with others in the private sector, such as elected officials and planning-zoning staff in the watershed ensures inadequate representation for the aquatic resource.

When those outside the natural resource disciplines fail to represent the aquatic resource adequately, one should not assume a disregard for the resource. It simply reaffirms the old marketing axiom that personal contact is the most effective form of communication---and resource professionals have the responsibility for making those contacts. Several planning agencies interviewed in the Chesapeake Bay program provide insights for fisheries biologists. These planners explained that they did not have the expertise to factor in fisheries considerations and would welcome input from fisheries biologists, if it could be made specific to a locality, if it were presented in a timely and unbiased manner, and if information were of quality sufficient for decision making.

In addition to increased personal interaction, effective communication is facilitated if resource professionals understand the common factors that make it difficult for aquatic and riparian ecosystem protection to be a convincing argument. Effective ways of dealing with these factors must be developed, because they will arise regardless of the specific issue at hand, whether it is land use in the Chesapeake Bay watershed, instream gravel mining in Arkansas, or riparian corridor restoration in Illinois. The following eight factors were identified by Carter (1992) and Missouri's experience in a statewide stream management program. The argument for ecosystem protection is difficult because

1. individual actions cause cumulative impact, but proving a demonstrable connection between the two is often impossible;
2. the basic concepts of fluvial processes are foreign to most people and difficult for many to grasp;
3. recommendations must often be based on the literature or theory, rather than data collected from the locality of concern;
4. effects on the resource usually cannot be quantified (e.g., in many cases the specific proportion of the biotic community that will be affected by an individual action or cumulative impact cannot be cited);
5. the results of recommended changes in the upper watershed will have to work through a complicated set of ecosystem linkages to affect the aquatic ecosystem;
6. those with a poor understanding of watershed dynamics have unrealistic expectations about the rate at which the resource will recover due to restoration activities;
7. Long-term, complex ecological benefits are difficult to make convincing when compared to short-term economic gains; and
8. most often, resource professionals must prove that an action significantly affects the resource, rather than the user having to prove a minimal impact upon the resource.

Developing strategies to overcome these factors is just one challenge facing resource professionals as they assume the

role of coordinators and technical advisors in watershed management. Traditional roles must be altered and steps should be taken to prepare professionals for these changes. Professionals in academic, management, research, and administrative positions must adjust their perspectives and priorities.

The implications of the watershed strategy are nowhere more acute than for resource professionals who have agency management responsibility. Strong support from line managers and administrators is needed to carry out successful riverine and watershed restoration and protection. Committing the required trained personnel and entering new areas of coordination and cooperation mandate strong leadership and a commitment to a long-term vision of the watershed strategy's potential.

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Getting In Step

A Guide for
Conducting
Watershed
Outreach
Campaigns

*New and improved tips and tools for
creating awareness, educating specific
audiences, and motivating positive
behavior change to improve water quality*

Getting In Step

A Guide for Conducting Watershed Outreach Campaigns

December 2003
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Getting In Step: A Guide for Conducting Watershed Outreach Campaigns was prepared by Tetra Tech, Inc., under a contract with the U.S. Environmental Protection Agency (EPA). This publication is a product of the Information Transfer and Outreach Workgroup established by the State-EPA Nonpoint Source Management Partnership. It is based on the original guide *Getting In Step: A Guide to Effective Outreach In Your Watershed*, published in 1998 by the Council of State Governments, pursuant to a cooperative agreement with EPA.

As a companion to this guide, EPA and the Utah Department of Agriculture and Food jointly developed *Getting In Step: A Video Guide for Conducting Watershed Outreach Campaigns* (EPA 841-B-03-001). The 30-minute video includes four in-depth case studies that showcase successful outreach programs from around the country and highlight key tips from this guide.

For copies of this guide and the companion video, contact
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Foreword

Nonpoint source pollution is our nation's largest remaining water quality problem. It is not caused by discharges from big factories or from sewage treatment plants. Rather, it is generated by all of us, a product of millions of actions that we take each day, including activities such as applying pesticides, fertilizing our lawns, or the manner in which we dispose of oil. While most of our individual actions have relatively small impacts on water quality, the cumulative impacts of how we choose to interact with our land and water is huge. However, by becoming more aware of the effect of our actions on our rivers, streams, lakes, and oceans, we can all develop more water-friendly habits and practices that will enable us to protect and restore the quality of these waters.

This guide offers advice on how watershed groups, local governments, and others can maximize the effectiveness of public outreach campaigns to reduce nonpoint source pollution and protect the lakes, rivers, streams, and coasts that we treasure. It expands upon a 1998 publication by the Council of State Governments, titled "Getting in Step: A Guide to Effective Outreach in Your Watershed." This update has benefited greatly from new information from the growing field of community-based social marketing, and contains significant additions in every section. It is intended as a reference that pulls together principles, techniques, and information for effective watershed outreach into a single, user-friendly source.

I am particularly pleased to note that this guide was produced by a unique partnership of the U. S. Environmental Protection Agency (EPA) and our state colleagues and jointly sponsored by EPA and the Association of State and Interstate Water Pollution Control Administrators (ASIWPCA). The guidebook was developed jointly by the State/EPA Nonpoint Source Information Transfer and Outreach Workgroup, which include active representation from EPA and 12 states.

A companion video, suitable for viewing by stakeholders, educators, or others interested in generating watershed outreach campaigns, is available to reinforce the steps outlined in this guide. The video includes four varied examples of watershed outreach campaigns that utilize the principles presented in this guide. I hope this guide is useful in continuing the important work of raising awareness of nonpoint source issues and changing individual behaviors that will lead to cleaner waters for your community and our nation.

Diane C. Regas, Director /s/
Office of Wetlands, Oceans, and Watersheds
U.S. Environmental Protection Agency



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Introduction

Purpose of this guide

The purpose of this guide is to provide the tools needed to develop and implement an effective outreach campaign as part of a state or local water quality improvement effort. Whether you're charged with developing a watershed management plan to restore impaired waters or protecting your local water resources for the future, this guide will help you understand the importance of reaching out to people and motivating them to act. It will help you understand the audiences in your watershed, create messages that resonate with them, find appropriate ways to communicate your message, and prompt changes in behavior to reduce water pollution.

This guide is an update of the 1998 publication *Getting In Step: A Guide to Effective Outreach in Your Watershed*. This updated version includes more specific information on how to work with the mass media to conduct an outreach campaign. It also provides new information on how to incorporate social marketing techniques into your campaign to generate sustainable behavior changes that will protect water quality. The guide will teach you how to listen to the needs of your audience rather than just blindly handing out fact sheets or reports that sit on shelves and collect dust. It will show you the important roles that audience research and program evaluation play in changing personal behavior. The step-by-step approach to social marketing and outreach planning and implementation in this guide will help you to determine the most effective vehicle to reach the target audience and motivate behavior change.

As a companion to the guide, the U.S. Environmental Protection Agency (EPA) and the Utah Department of Agriculture and Food have jointly developed a how-to video called *Getting In Step: A Video Guide for Conducting Watershed Outreach Campaigns*. This 35-minute video provides background on the six steps for conducting an environmental outreach campaign and includes four in-depth case studies that showcase successful local outreach programs from across the country. The video icon  in this guide highlights information from the video case studies.

In addition to the outreach guide and video, EPA recently published a new guide in the *Getting in Step* series on stakeholder involvement.

What's in the Introduction

- Purpose of this guide
- Why is outreach needed?
- What's being done?
- How can outreach help get the job done?
- How can outreach help change behavior?
- What's inside

Outreach and education can help create an awareness of the value of our water resources, educate people on what's threatening the resources, and encourage protective action.





Getting in Step: Engaging and Involving Stakeholders in Your Watershed was released in February 2003. The Stakeholder Guide features information on how to generate interest and participation in watershed assessment, planning, and management. Web-based versions of all these guides are available on EPA's Web site at www.epa.gov/owow/watershed/outreach/documents.

Why is outreach needed?

We've made a lot of progress cleaning up America's lakes, rivers, and streams since the passage of the 1972 Clean Water Act. We don't have fires on rivers anymore. Fish kills are down, and the quality of sewage treatment has improved dramatically. But even with all our laws and regulations, about 40 percent of the nation's waters are still too polluted for fishing, swimming, and other uses. Compounding the problem is a lack of public awareness. In a survey for the *Ninth Annual National Report Card on Environmental Attitudes, Knowledge, and Behaviors* (May 2001), the National Environmental Education and Training Foundation found that 45 percent of respondents believe that the most common cause of water pollution is still factories.

Some of the worst problems have been solved. The Clean Water Act has focused a powerful array of regulations and resources on improving wastewater discharges from cities, factories, and other facilities. Billions of dollars have been spent on new treatment plants, permitting systems, and inspections. But many of America's waters are still contaminated by sediment, sewage, disease-causing bacteria, fertilizers, manure, toxic metals, and oil and grease. Some of our stream corridors, riverbanks, and lakeshores lack stabilizing vegetation and continue to erode, further degrading water quality and aquatic habitat.

Today, polluted runoff is the source of most of the contamination in the nation's waters. Heavy rains and melting snow pick up pollutants and transport them downhill toward the nearest body of water or leach through the soil, carrying pollutants toward ground water supplies.

Runoff from an urban or suburban area, for example, is likely to contain the following:

- Fertilizer and pesticides leached from lawns
- Oil and antifreeze washed off driveways
- Bacteria and organic matter from pet waste
- Sediment from construction sites
- High storm flows and increased stormwater temperatures

Runoff from farms, homes, or factories in rural areas can contain many of the same pollutants. Multiplied by hundreds or thousands of acres in a watershed, the cumulative effect of polluted runoff can be devastating to the receiving waters downstream.

Point versus nonpoint



Point source pollution is defined as pollution that comes from factories and sewage treatment plants. It is usually discharged to waterbodies through pipes.

Nonpoint source pollution (also called polluted runoff) comes from many diffuse sources. It occurs when rainfall or snowmelt moves over and through the ground. As it moves, this runoff picks up pollutants like dirt, oil, and fertilizers and carries them to lakes, rivers, coastal waters, and even our underground sources of drinking water.

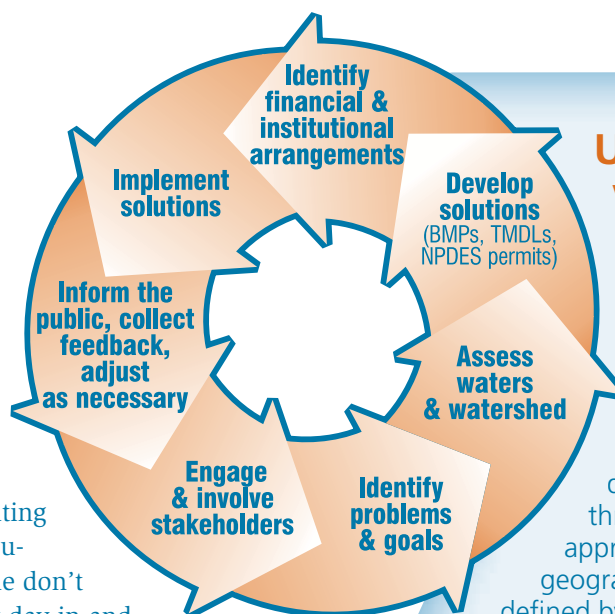


What's being done?

EPA and state and local governments are addressing these challenges by focusing on some of the remaining major sources of water pollution (e.g., urban streets and parking lots, livestock farms, septic tanks). They're implementing best management practices (BMPs) to reduce polluted runoff and launching new initiatives to educate people and motivate them to change their own personal behaviors to help in the effort. But the problems are so widespread that fighting polluted runoff requires the efforts of individuals and communities nationwide. Most people don't realize that many of the things they do every day in and around their homes contribute to polluted runoff. Those individual behaviors need to be changed. Making a change from pollution-generating behaviors to pollution-preventing behaviors will require education, enlightenment, and new attitudes. When people know, understand, and change how they do things, polluted runoff problems can be solved.

How can outreach help get the job done?

Many state and federal agencies require some form of outreach or public education and involvement as part of their water quality laws and regulations. For example, Phase II of EPA's National Pollutant Discharge Elimination System (NPDES) stormwater regulations, which calls for small municipal separate storm sewer system operators to develop and implement stormwater management programs, requires that localities provide opportunities for citizens to participate in the development of the program and that they distribute educational materials on stormwater runoff. Developing an effective outreach campaign not only will help gain the critical support and compliance that will lead to the ultimate success of the stormwater management program, but also will help meet the federal requirements EPA has set. If your program requires the cooperation of the public to meet its legal obligations, making the audience aware of the issues, educating them on what needs to be done, and motivating them to take action will help you meet both your regulatory and water quality objectives.



Using a watershed approach

Much of the current effort at the federal and state levels to clean up pollution and protect water quality is organized through a watershed approach focused on geographic boundaries defined by drainage basins instead of political or jurisdictional boundaries. This approach provides a flexible coordinating framework that focuses public and private efforts on targeted problems within specific drainage basins. The guiding principles of the approach are stakeholder partnerships, a geographic focus, and sound science. Thousands of projects over dozens of years have shown that involving the people affected by watershed management decisions in making those decisions generates high levels of long-term support and success. Even more important, however, is motivating changes in individual behaviors in the watershed to help achieve watershed results after watershed plans have been developed.

Constant feedback is necessary to determine whether the practices used actually help clean up or protect the lake, river, stream, wetland, or ground water source of concern. Throughout the process, there is a continuous need to inform, engage, and motivate water quality managers, "sideline" stakeholders, cooperating agencies, elected officials, so-called "bad actors," and the public. Outreach campaigns can be powerful tools in this process.

How can outreach help change behavior?



Changing behavior through education and developing responsible attitudes among watershed citizens and communities is not a simple task, but experience has demonstrated that it can be done. Think of times when you've changed your own attitude or behavior, perhaps when you finally realized that it really isn't so hard to separate the recyclables from the trash or decided to get serious about a diet or exercise program. A few things happened before the behavior change took place. First, you received information on the ramifications of your current behavior—specific data on the problem. Then you linked your actions to something you cared about—your health or your pocketbook, for instance. Finally, you decided to do something about it. Maybe you haven't achieved the success you ultimately want, but you're trying and you're better off now than you were.

That's the approach needed to address polluted runoff. Although it's important to let people know about the water quality problems the professionals have found, sometimes simply informing and educating people on the issues is not enough to initiate behavior change. The most effective way to get people to change their behavior is through social marketing.

Social marketing means looking at the target audience as consumers. Instead of selling products or services, social marketing sells ideas, attitudes, and behaviors. The goal of social marketing is not to make money, but to improve our society and the environment. Social marketing might be most familiar to you in terms of preventing drunk driving or forest fires. Everyone knows the popular slogans—"Friends Don't Let Friends Drive Drunk" and "Only You Can Prevent Forest Fires." These social marketing campaigns persuade the public that a problem exists that only they can solve. The campaigns benefit the public at large and the environment.



Social marketing involves identifying and removing the barriers that have prevented the consumer from "buying" the recommended behavior. For example, if you're trying to get people to test their soil before they apply lawn fertilizer, you can make it easier for them: sponsor a soil test day on which a local garden supply store hands out free soil test kits and demonstrates their use. This approach will go a lot further toward getting people to test their soil than merely sending out a flyer in the mail. The key to effective social marketing is talking and listening to the people you're trying to reach.



What's inside

Getting In Step provides the overall framework for developing and implementing your outreach campaign in concert with an overall water quality improvement effort. It presents the outreach process as discrete steps, with each step building on the previous ones. The steps are as follows:

- Define the driving forces, goals, and objectives
- Identify and analyze the target audience
- Create the message
- Package the message
- Distribute the message
- Evaluate the outreach campaign

Appendices A–D include worksheets to help you develop your outreach plan. They may be photocopied and used as templates for preparing your plan. Appendix E provides information on additional resources for outreach and education. It includes publications, Web sites, phone numbers, and other available outreach materials.

Throughout the guide, sidebars provide specific examples, key concepts, and recommended resources for obtaining more information.

So let's get started on developing an effective watershed outreach campaign...



The key to successful outreach is targeting your message to a specific audience and having them respond to your message.



Part 1: Developing a Watershed Outreach Campaign Plan

To develop an effective outreach campaign, you need a plan. Just as you would never drive through unfamiliar territory without a map, you should not conduct an outreach campaign without a plan. The planning process presented in this section follows well-defined steps, and it's important to identify the elements and information needed to complete each step before proceeding to the next one. Each step is more or less defined by the previous one, so it's vital to go through the steps sequentially and completely before moving on. Too often, someone starts in the middle of the process, and important steps—identifying measurable objectives or defining target audiences, for example—are ignored. Such an unfocused approach is often ineffective and wasteful.

Step 1: Define the driving forces, goals, and objectives

Once you've decided to take on an outreach campaign, you'll need to identify its driving forces. You'll also need to set goals and objectives to guide the process of engaging and informing those who are contributing to water quality degradation and motivating them to adopt more appropriate behaviors.

Driving forces

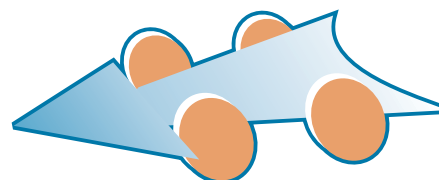
Identifying the forces that are driving the need for an outreach campaign will help determine the scope of the campaign and focus it on exactly what will get the job done. The driving force for a campaign often centers around a specific issue, such as a violation of state or federal water quality standards, the need to upgrade an NPDES permit to expand wastewater treatment capacity, or unmanaged development that has led to increased flooding and water quality problems.

What's in Part 1

- Step 1: Define the driving forces, goals, and objectives
- Step 2: Identify and analyze the target audience
- Step 3: Create the message
- Step 4: Package the message
- Step 5: Distribute the message
- Step 6: Evaluate the outreach campaign
- Where do I go from here?

What's in Step 1

- Driving forces
- Goals
- Objectives
- Setting up the evaluation process



For example, the City of San Diego faced two powerful driving forces when addressing stormwater pollution—one political and one regulatory. The city initiated “Think Blue” (www.thinkbluesd.org), a stormwater education and pollution prevention campaign, in response to a city council vote to reduce beach postings and closures by 50 percent based on public pressure. In addition, the city’s stormwater permit specifically required documentation of behavior change and an increase in stormwater awareness among city residents.

 Check out the *Getting In Step* video.



Building Blocks:

Driving Forces, Goals, and Objectives

Herndon County (a hypothetical locality) is suffering the effects of rapid development. The county’s population has increased by 107 percent over the past 20 years. Many watersheds in the county are facing serious water quality problems, including phosphorus and nitrogen overloading caused by urban runoff, sedimentation and erosion, bacterial contamination, and flooding due to impervious surfaces.

To overcome many of these problems, Herndon County developed a watershed management plan to provide a planning framework for the county to make the most supportable, cost-efficient decisions on management practices that will restore and protect water quality. The county’s overall goals for the plan are the following:

- Maintain the environmental goals set for the county’s streams and lakes by the state
- Reduce nutrient runoff from residential and commercial areas
- Reduce the potential for flooding as development occurs
- Increase awareness about water quality problems and solutions to protect water quality
- Strengthen the linkage between land use activities and water quality and flooding
- Satisfy the requirements of the NPDES Storm Water Phase II regulations

The overall goal of the county’s public outreach program is to “increase the involvement of the community in watershed protection activities through awareness, education, and action.” The public outreach program will directly support the watershed management goals.

The following are some of the objectives that county staff identified to help achieve the outreach program’s goal:

- Research the level of awareness in the county through focus groups and a phone survey in the spring
- Make residents aware that they live in a watershed and that their day-to-day activities affect water quality
- Increase awareness of residential nutrient runoff by 25 percent within 1 year and encourage behaviors that will reduce nutrient pollution in local streams and lakes
- Through a 6-month media campaign, educate residents and businesses about the link between land use activities and water quality/flooding, as well as about the county’s role in protecting water resources and managing stormwater

Development pressure was the driving force in west Michigan, where protection of the Bear Creek watershed meant gaining public buy-in for the development of stricter ordinances outlining where homes could be built. The Bear Creek Watershed Project organizers launched a hefty outreach campaign to spread their message.



Check out the [Getting In Step](#) video.

Development of a Total Maximum Daily Load, or TMDL (the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards), can also generate the need for an outreach campaign (see box). Once a TMDL is calculated for a waterbody, stakeholders in the watershed should be educated on what they can do individually to help meet the objectives of the TMDL. Such stakeholder involvement is a very important part of the process. To find out how to effectively engage stakeholders in water quality protection, read the companion guide, *Getting In Step: Engaging and Involving Stakeholders In Your Watershed*. The stakeholder guide is available on EPA's Web site at www.epa.gov/owow/watershed/outreach/documents.

Goals

Keeping the driving forces you identified in mind, you can now develop goals and objectives for your campaign. Goals are general statements that express the broad focus of your effort.

Make sure that your goals link back to the driving forces. For example, in response to declining fisheries, the goal of your watershed project might be to protect and restore a local trout fishery. You've decided that outreach is needed to increase public awareness about the importance of the trout fishery to the community and increase community involvement in protecting and restoring the fishery. Later on, you'll develop and implement a wide range of specific measurable objectives to support those goals.

In some cases, there might not be an overarching water quality improvement effort driving your campaign. For example, if your community's trout fishery is not yet in trouble but you would like to preserve and protect its pristine nature and ensure its quality for future generations, the goal of your outreach campaign might be simply to generate awareness of the importance of the fishery and the need to protect it. No problem is necessary before a campaign can begin. Prevention is the best medicine. Remember that awareness is the first step toward behavior change.

Objectives

The objectives developed to achieve a goal should be specific, measurable, action-oriented, relevant, and time-focused (SMART). You'll probably develop several objectives for each goal you're trying

TMDLs as a driving force

A Total Maximum Daily Load (TMDL) is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources.

For the past 10 years, TMDLs have increasingly become the driving force behind major water quality improvement projects across the country. In 1998 states reported more than 41,800 impairments affecting some 20,000 waterbodies. An estimated 36,000 TMDLs for these waters might need to be completed in the next 8 to 13 years. Many states are subject to even shorter, court-ordered schedules for their TMDLs.

Is it a mission, a vision, or a goal?

Many people get hung up on the terminology when setting their goals. The important thing to remember is that it is a hierarchy: you move from the broad (goals or mission statements) to the specific (objectives and tasks). Each subsequent level should answer the question "How?" from the previous level. For example, if your goal is to restore the trout fishery, the next level down should answer "How would you restore the fishery?"



During a 2001 focus group study, EPA found that although some people have heard the term *watershed*, few people understand it well enough to be able to define it and, more importantly, few people see the importance of understanding what a watershed is in addressing the problem of nonpoint source pollution. Linking the problem to the causes is often the most important stage of education.

to achieve. Keep the desired outcome in mind when forming your objectives. Do you want to create awareness, provide information, or encourage action among the target audience? It's very important to make your objectives as specific as possible and to include a time element as well as a result. This approach will make it easier to identify specific tasks and will enable you to evaluate whether you've achieved the objective. For example, an objective for the goal of increasing community involvement in the protection and restoration of the trout fishery might be to start a citizen volunteer monitoring program by next year.

It's important to remember that as you progress through the phases of developing and implementing an outreach campaign, your outreach objectives and activities will change. As the target audience becomes aware of the issues, you'll focus your efforts toward action. For example, during the early stages of the planning process, it might be necessary to generate basic awareness of watershed issues and define polluted runoff; but as problems are identified, your objectives will focus on educating the target audiences on the causes of the problems and the potential solutions. Finally, your objectives will change to motivating action by the target audience to reduce adverse water quality impacts. Listed below are some general watershed project goals, with examples of the types of outreach objectives that should be considered for each goal:

Goal: Create a grassroots watershed association.

Objective: Within 6 months, identify five organizations willing to become project partners by signing a Memorandum of Agreement.

Goal: Develop a shared community vision or goal for the water resource.

Objectives: Hold two meetings in July to solicit comments from stakeholders and the public on what they envision for the watershed in the future; communicate elements of the agreed-upon goal or vision at both monthly watershed association meetings and town council meetings.

Goal: Conduct a baseline assessment of watershed conditions.

Objectives: Through local media outlets, notify organizations and the public the first week of March that baseline studies are under way; encourage those with information on abandoned dump sites or other possible contaminant sources to contact the planning team by the end of May to ensure that the information is included in the assessment.

Goal: Identify and prioritize stressors or problems preventing attainment of the vision.

Objective: Educate the target audience about how the identified stressors affect water quality, the types of management practices that might be needed, and how the prioritization process works through presentations and exhibits at three currently scheduled community events (county fair, Stream Cleanup Day, and Lions Club Antique Festival).

Goal: Evaluate watershed management program success, and adjust approach if necessary.

Objectives: Recruit volunteer monitors to gather long-range information on water quality trends; conduct five volunteer monitoring training courses over the next 2 years.

Once your objectives are defined, you'll need to prioritize them. You should evaluate which objectives are most important to help meet your overall goal. The priority goals and objectives you focus on might change from year to year because of political, economic, or climatic influences.

Use the Building Blocks worksheets in Appendix A to help you define the driving forces, goals, and objectives for your campaign.

Setting up the evaluation process

Although Step 6 of this guide provides more in-depth coverage of how to evaluate your outreach campaign, building in evaluation from the beginning and during every step will ensure that you stay on the right track and meet your program objectives. Ideally, feedback generated after each completed step will help you carry out the tasks for each subsequent step more effectively. This guide includes specific evaluation questions after each step to help you along the way. Keep in mind, however, that what is successful in one region of the country might not work in another region, state, or even county. By the same token, failure of a particular method of outreach for one issue or in one area does not necessarily mean that it won't work for your campaign. In the next step you'll learn how researching your target audience will help you determine what might work best for your situation.



PROCESS CHECKLIST

Step 1: Define your driving forces, goals, and objectives

- ☐ Are the objectives consistent with the planning team's goals?
- ☐ Are the objectives specific, with time limits and measurable components?
- ☐ Will the objectives be accepted and understood by the people that will be affected by them?
- ☐ Will I be able to evaluate whether the objectives were accomplished?
- ☐ Do I have the resources to accomplish the identified objectives?



"We conduct an annual phone survey that reaches about 450 households to determine changes in behavior and increased awareness of watershed issues. We use the information to help shape our media campaign for the next year, deciding where to put our resources and what issues we need to focus on."

—Deborah Castillo, City of San Diego Storm Water Program
www.thinkbluesd.org



Check out the *Getting In Step* video.

Step 2: Identify and analyze the target audience

What's in Step 2

- Segmenting the audience
- Determining what information is needed
- Gathering audience profile information
- Analyzing and understanding the audience



Once you've identified your goals and objectives, you need to identify the audiences you'll target to achieve your objectives. The target audience is the group of people you want to reach with your message. In some cases it might be obvious, but in others you'll be able to identify it only after conducting research. For example, if you're trying to decrease lawn fertilizer applications, do-it-yourself residents and lawn care companies might be target audiences. If you want to increase streamside vegetated buffers, property owners along the stream corridor might be one of the target audiences. If you want to discourage people from purchasing toxic household products, your target audience might be stay-at-home parents who do most of the household shopping. Raising general awareness of the value and function of a water resource, however, will necessitate a very broad target audience. And remember, although raising the general awareness of the audience is an important first step, it should not be the final goal of your effort.

In reality, there is rarely just one audience. The messages you develop need to be tailored to the different segments of the community that you wish to reach. For example, a campaign to reduce shoreline erosion caused by heavy boat wake at a lake should be targeted at two different audiences—homeowners with shoreline property and docks as well as summer and weekend lake visitors. Each audience uses the lake differently and might place a different value on its resources. Both, however, will benefit from the collective reduction in boat wake action along shorelines.

In all cases, break down the target audience into the smallest segments possible that still retain the characteristics of the audience so that when you reach the audience with your message, they'll help you achieve your objective. If the audience is too broad, chances are you won't be able to develop a message that engages and resonates with the entire target audience.

Think of the audience as your customer. You're selling a message. You want the audience to "buy" behaviors and attitudes that will achieve your goal. For the audience to want to buy those behaviors and attitudes, you need to persuade them that the behaviors will satisfy their needs. Although your "customers" should be informed of the link between their actions and water pollution, you should also be aware that most people are primarily interested in saving time, saving money, or gaining social prestige—more so than protecting the environment. Ask yourself, "What's in it for them?" Finding out what's important to the audience will help you craft the message that will resonate with them most effectively.

Be sure to read Step 2 fully before you begin to identify and segment the audience. The section “Analyzing and understanding the audience” (page 23) will help prepare you for researching your audience.

Segmenting the audience

Target audiences can be grouped in several different ways depending on your objectives. Four common groupings follow. (Keep in mind that segmentation using these groups is a starting point only. You will have to define the audience further in Step 2.)

Geographic location

Audiences are segmented based on specific geographic areas in the watershed such as school districts, county boundaries, residences along a specific stream corridor, or ZIP codes.

Demographics

Audiences are segmented based on demographic characteristics, such as ethnicity, gender, age, income, recreational activities, organizational affiliations, or ownership of specific types of property (e.g., forestland, undeveloped waterfront).

Occupation

Audiences are segmented based on the primary occupations of the target audience in the watershed, such as owners of lawn care companies, developers, county commissioners, automobile service station managers, loggers, or livestock producers.

Behavior patterns

Audiences are segmented based on current practices, e.g., residents who don’t recycle, homeowners who dispose of leaves and grass clippings on stream banks, or farmers who plow and plant riparian corridors.

The target audience definition can consider more than one of the above groupings. For example, if you want to generate awareness among students about the degradation of Lake Townsend, you might want to target the audience based on demographics and geography (e.g., schoolchildren ages 12 to 17 within the Lake Townsend watershed).

Deciding which segment to target

One of the keys to knowing which segment of the target audience you need to focus on is understanding the concept of social diffusion. This means that when a new idea or behavior is adopted by 15 to 20 percent of an audience, it has the critical mass to spread on its own. Dr. Everett M. Rogers developed this theory after more than 30 years of research. In his book *Diffusion of Innovations*, Dr. Rogers discusses five categories of people within an audience that generally adopt new behaviors



Kids Organized to Protect Our Environment (KOPE) in Utah targeted its outreach efforts on the trustees of the Sugarhouse Community Council to persuade local decision-makers to pass an open space ordinance. KOPE wanted to protect a local stream from being turned into a shopping center parking lot.



Check out the Getting In Step video.

in sequential stages and at a fairly predictable rate: (1) innovators, (2) early adopters, (3) early majority, (4) late majority, and (5) laggards. Identifying which category members of the audience might fall into will help you understand how to motivate them. The people in these categories adopt new behaviors at different rates and require different amounts and types of encouragement.

- **Innovators** are often seen as venturesome. They frequently have high education levels, high social status, and upward social mobility. They are usually better able than others to cope with uncertainty and high risk.
- **Early adopters** are second only to innovators in the speed with which they adopt a new behavior. Others often view them as decisive and influential.
- The **early majority** is the segment of the audience that is more deliberate than the innovators or early adopters when making decisions. People in this category tend to be cautious and seek a lot of information on an issue before they make a decision.

Neighborhood outreach

The Empowerment Institute (EI), a consulting company that specializes in designing behavior change programs, has developed a Livable Neighborhood Water Stewardship Program, a residential nonpoint source behavior change and outreach program. The program may be used in a generic format or can be customized to meet the specific needs of a municipality or non profit organization. It is delivered by municipal or non profit staff who receive program materials, comprehensive training and coaching from EI. Participants receive EI's Creating a Water Friendly Lifestyle handbook, which identifies over 30 specific actions they can select from, such as "No Phos-for-Us" (phosphorus-free car washing), "A No Rainer" (installing a rain barrel), and "Catch It While You Can" (creating a rain garden). Citizen participation is achieved by identifying the most motivated persons in a neighborhood to start the ball rolling.

This Team Leader then convenes and leads a Water Stewardship Team consisting of five or six neighborhood households. They meet five times over a 2-month period and support each other in carrying out the actions. The program piques citizens' interest in getting to know their neighbors better and, most important, finding out how they can become good water stewards. The Team members help each other to reduce water pollution and engage in other practical, water friendly behaviors. The program teaches participants how to reach out to their neighbors, host informational meetings in their homes, and start new teams. Behavior changes are documented through baseline and follow-up questionnaires. Visit www.empowermentinstitute.net to learn more.



- The **late majority** is the largest of the five categories. These people are conservative, often set in their ways, and skeptical about trying new things and adopting new behaviors.
- **Laggards** are the most resistant to change. They are the least likely to adopt a new behavior no matter how hard you try to educate and motivate them.

Picking the low-hanging fruit

Many outreach campaigns fail because organizers believe they need to focus heavily on targeting the late majority and laggards segments since they encompass the greatest number of people. However, the late majority and laggards are the hardest people to reach and the hardest to convince that they should change their behavior. It is much easier to reach and convince innovators or early adopters.

Once you've reached the members of these categories, they can become partners to start the diffusion process in their own circles. Because they are considered to be leaders and are well respected, their peers will be more likely to pick up the new behavior. When it comes to changing behavior, success means "preaching to the choir." Focus your efforts on those most likely to adopt the new behavior and then let them spread the message or behavior in their own spheres of influence.

Once you've identified the target audience, you'll need to gather information on them before proceeding to the next step. Conducting at least a rudimentary analysis of the target audience is a task that's often ignored, but such an oversight can render the rest of the outreach plan useless. To develop an effective message that resonates with the audience, find out what they think about the issues and what messages might engage and motivate them.

What information do I need about the target audience?

First, remember that the target audience is your customer. You want to sell your customer a product (e.g., environmental awareness, membership in an organization, participation in a stream restoration project, or some voluntary behavior change). So you need to find out what will make the customer buy the product. Keep in mind that you cannot assume that the customer's reasons or values will be the same as yours. Several types of information are needed to characterize and assess the customer.

Demographics

Collecting demographic information will help define the socioeconomic structure of the target audience, the appropriate education and age levels for proposed messages, and the types of organizations that could be engaged to implement outreach activities. For example, retired persons, with more free time, are able to volunteer more often.



Basic information needed about the target audience

- What are the demographics of the audience?
- What is the knowledge base of the audience regarding watershed issues?
- How does the audience receive information?
- How do members of the audience communicate among themselves?
- Does the audience think there is a problem?
- If so, who do they think is responsible?
- How does the audience perceive your organization?



Reaching Amish farmers

In Lancaster, Pennsylvania, the Natural Resources Conservation Service learned that to convince Amish dairymen to keep the cows out of the stream to reduce pollution, traditional outreach methods using television, radio, or phone calls were not options. Instead, they turned to one-on-one chats with the farmers themselves.

“The Amish were going to be our focus since they own most of the land and are all dairymen. The problem with working with the Amish is that they don’t have phones. If you want to see an Amish man, you’ve got to jump in your car and drive out and look for him.”

—Frank Lucas, Pequea-Mill Creek Project Leader, Natural Resources Conservation Service



Check out the *Getting In Step* video.

Religious groups promote the environment

In Louisiana environmental leaders used religious commonalities to help reach environmental goals. Religious congregations throughout the coastal area joined to sponsor a series of public forums to engage local citizens in efforts to protect and conserve Louisiana’s coastal wetlands. The forums were held in local churches and synagogues, which provided a neutral atmosphere that fostered cooperation among the attendees.

Knowledge of the issue

Determining baseline knowledge of watershed issues among members of the target audience will establish where you need to begin to define your issue. For example, does the target audience know what a watershed is or understand what causes polluted runoff? If not, you have to define those terms before you use them in your messages.

Attitudes, beliefs, and perceptions

Exploring what people in the target audience think about an issue or problem and what they value and believe will help you link watershed issues with the audience’s concerns. If they don’t believe a problem exists or don’t understand how it affects environmental resources they value, you’ll need to educate them before expecting them to take action.

Remember: Perception is reality. How is your organization perceived by the target audience? If not favorably, you might want to have someone else deliver your message.

Communication channels

Finding out how the target audience gets its information will help you to develop, format, and distribute your message. What newspapers, magazines, or newsletters do they read? To what organizations do they belong? Do they receive information in other forms such as community radio programs? Do they watch local news or cable television? Do they even have televisions? Understanding what communication channels the target audience uses and trusts will help lend credibility to your message. It is important to use communication channels that the target audience perceives to be unbiased.

Social data

Collecting information on the types of relationships and cultural beliefs and norms present in your community can help you identify the barriers to changing behavior, better ways of communicating your message, and the formats that might be most appropriate to deliver your message. Social data will also give you insight on who talks to whom, who makes decisions, and who follows others. Understanding community culture and its wide range of distinct and shared values, attitudes, behaviors, and beliefs can help you understand what people care about and why, as well as what motivates them to take action. Knowledge about racial, religious, and cultural heritage in your community can help you understand why people behave in certain ways, hold certain beliefs, or communicate in certain ways. By collecting social data, you can gain a better understanding of how a community’s values and beliefs relate to environmental issues. In addition, social data, such as what social or religious groups have strong memberships among the target audience, might help you identify additional ways to distribute your message. These groups are often well respected within a community, and because they already have the ear of your audience, it will be easier to communicate through them.



How do I get information on the target audience?

Now that you know what kinds of information you need from the target audience, how do you get it? You can use several different tools depending on the makeup of the target audience and your available resources (time and money). Any information you collect will make your campaign stronger, so don't worry if you don't have access to a Census Bureau database or can't make your survey results statistically significant. Research other campaigns targeted at the audience by other organizations or municipalities and learn how they collected information. Find out whether any of the information they collected might help your cause and save you from reinventing the wheel. A good place to start would be at the U.S. Census Bureau Web site (<http://factfinder.census.gov>) or at RoperASW (www.roperasw.com), a commercial site focused on consumer attitudes, shopping styles, and media habits.

If you don't have ready access to the information you need on the audience, the following tools will help.

Demographic databases

All sorts of databases that contain information on the demographic makeup of potential target audiences are available. Census data are collected every 10 years and were last collected in 2000. These data are available through the Internet from the U.S. Census Bureau at www.census.gov and from local libraries. If you don't have access to these files or don't have the resources needed to extract the information, consider asking a college marketing class for assistance. They could be looking for real-world projects, and they might be willing to conduct a detailed analysis of the target group at no charge.

Pros/Cons. Databases can provide consolidated demographic data and can sort the data by different parameters. However, the data might not be current, and you might not have the staff or equipment to manipulate the data. In addition, although the data might provide information on ethnic populations and distribution, those data will not help you understand the cultures in the audience. For more information on collecting cultural information, see the section "Community cultural assessment and characterization" on page 20.

Public agencies

Local public agencies, such as planning departments and property valuation agencies, can be valuable sources of information on the makeup of the target audience. Be sure to contact them early in the data-gathering process. Information collected in this manner should be held in confidence: circulating perceptions and other information provided in private can seriously harm your credibility and effectiveness.

Pros/Cons. Public agencies might have access to large populations and have information on the target audiences collected over a long period of time. The agencies might not, however, have this information in a readily available format. Agency personnel might not be forthcoming

Tools to gather audience profile information



- Databases
- Public agencies
- Trade associations
- Surveys
 - Mail
 - Phone
 - E-mail/Web
 - Personal
- Focus groups
- Community discussions
- Observation
- Community cultural assessment and characterization

with personal information on the composition, perceptions, or values of the target group.

Trade associations

Trade associations keep track of marketing research and other information on their members. If the target audience is associated with a trade group, contact the organization to see what's available. For example, if you want to collect information on auto repair shops that recycle used motor oil, an automobile parts trade association might provide you with names, addresses, and association meeting schedules. Your local Chamber of Commerce can also provide information on local businesses and the demographic makeup of the community.

Pros/Cons. Trade associations might have information specific to the target audience and could possibly serve as a distribution mechanism for your message. The data might be biased toward their constituency, however, and might not be available for outside use.

Surveys by mail

A mail survey is an excellent way to obtain baseline information about target audiences. It can also be used to conduct a post-project evaluation to measure changes in attitudes or behavior in the target audience. Before conducting a mail survey, make sure you'll be able to obtain current addresses for the portion of the target audience you are surveying. Keep in mind what information you want to collect, how you're going to use that information, and how the data will be tabulated. This planning can save a lot of anguish once the results come back. Make the survey relatively short, and explain up-front how long it will take the respondent to fill it out. State the objective of the survey clearly, make the format easy to read, and include a self-addressed stamped envelope to increase the return rate. If you want your results to be statistically meaningful, consult a marketing professional or college instructor for suggestions on survey design, random sampling techniques, follow-up prompting, and other considerations. You might also want to offer giveaways to survey respondents as incentives to participate.

Pros/Cons. Mail surveys allow participants to think about their answers before they respond, can reach large numbers of people, and can gather data from people who might not be accessible in person. The disadvantages of mail surveys include printing and mailing costs, staff time for tabulating results, and the potential for low response rates. Typical survey response rates range from 40 percent to 20 percent or less. In addition, the people who complete the survey are likely to be those interested in your topic, which can introduce bias in your results.

Surveys by phone

Surveys by phone can also provide good baseline (and post-project) information on the target audience. Again, make sure you have access to current phone numbers for the portion of the target audience you are calling and the resources available (phones and volunteers) to

Don't soil our waters

For years the Maine Department of Environmental Protection (DEP) has worked to educate the public about soil erosion and its detrimental effects on water quality. However, phone surveys continued to show that the public knew very little about the effects of soil erosion on water quality or how to address them.

Before implementing a statewide educational campaign on the issue, DEP worked with two focus groups to obtain input on citizens' ideas, thoughts, and behaviors regarding soil erosion and water pollution. The focus groups helped DEP decide which communication materials—newspaper ads, radio ads, and direct mailings—to use in a pilot advertising campaign.

Follow-up telephone surveys conducted after a test ad campaign revealed that the newspaper and radio ads were most effective. The direct mailings were not as effective because the cost per response received was greater than that of the other formats. Of those who remembered seeing or hearing the newspaper and radio ads, nearly 70 percent could describe at least one action that they could take to reduce soil erosion. For more information, visit www.state.me.us/dep/blwq/doceducation/dirt.htm.



carry out the survey. The success of phone surveys tends to vary geographically: rural audiences can sometimes be more willing than urban audiences to take the time to answer questions. Standardize the greeting used by all of your volunteers, and practice proper phone skills. If a person called does not want to participate, thank the person and move on to the next one. Hold practice sessions to be sure that all surveyors ask the questions the same way. Schedule calls at mixed times—some during weekends, some during the day, but most in the early evening.

Pros/Cons. Phone surveys allow data gathering from people who might not be accessible in person, elicit immediate responses, and can accommodate many participants. In addition, the anonymity might allow people to be more honest. The disadvantages include the need to access correct phone numbers for participants, the lack of time for participants to think about their responses, the level of resources involved, and exclusion of those who will not respond to unsolicited calls or do not have telephones.

Surveys by E-mail/Web

Done correctly, an e-mail or Web survey offers an anonymous way for your target audience to communicate with you and tell you how they really feel about your organization and your programs. E-mail surveys can be sent through your organization's e-mail system so respondents can access the survey and respond using their e-mail programs. If you place surveys on your Web site, respondents visiting the site can respond to the survey through online forms.



How to conduct a survey

Select the sample

Your survey participants should be members of the target audience. Ideally you should choose the number of people you need to survey to yield statistically significant results. You might be constrained, however, by time, staffing, or funding. In 1999 the Center for Watershed Protection (CWP) conducted a survey of Chesapeake Bay residents' behaviors and attitudes regarding three practices that contribute to nutrient pollution—lawn fertilization, septic system maintenance, and picking up after pets. Telephone interviews were conducted among a random sample of 733 residents in Maryland, Pennsylvania, and Virginia. For your survey, a small, representative sample could reflect the larger group, but the larger the sample, the more precise your survey results will be. Keep in mind, however, that the rate of improvement in precision decreases as your sample size increases. For example, increasing a sample from 250 to 1,000 only doubles the precision; it does not quadruple it.

Design the questionnaire

Keep your survey short and simple. Long questionnaires get less response than short questionnaires as a general rule, so try to stay well under 5 pages or 20 minutes by telephone. The CWP's survey contained 35 questions and was limited to 5 to 7 minutes to increase the likelihood of participation. (The final report and survey instrument are available online at www.cwp.org/UNEP_all.PDF.) Also consider how you will handle and analyze the responses. Will you use a computer program while conducting the survey or will you enter the data later? Making these decisions early on will make tabulating the results quicker and easier.

Subjects are also more likely to respond to a survey based on question content, particularly if they are involved and interested in the issue. Include an introduction or welcome message at the top to give your respondents as much information as possible. Questions can be multiple choice, ratings or agreement scales (such as the Likert Scale, which measures attitudes), or open-ended fill-in-the-blanks. The visual format also makes a difference. Maintain a logical left-to-right flow for minimal distraction. And try to keep your answer spaces in a straight line, horizontally or vertically. Be sure to leave a space at the end for "Other Comments."

Conduct the survey

You've identified the issues, selected your sample, and designed the questionnaire. Now it's time to conduct the survey. Surveys are traditionally administered by phone, by mail, or in person. In recent years online surveys through e-mail or on the Internet have become popular. These formats are discussed in detail starting on page 13.

Analyze the data

Once all the results are in, the data must be analyzed. For those on a low budget, it may be as simple as tallying the results on paper. For those with a bit more funding, several commercial software packages are available to design and conduct your surveys and provide statistical analysis. Many are available on the Web.

Additional resources

Web Surveyor, www.websurveyor.com
StatPac, Designing Surveys and Questionnaires, www.statpac.com/surveys
Survey System, Survey Design, www.surveysystem.com/sdesign.htm





Tips for reducing bias

It is virtually impossible to conduct a perfectly unbiased survey. But by taking a few precautions, your survey can be closer to being 100 percent accurate and objective. The main sources of bias in a questionnaire are

- **Nonrepresentative sample**

Ensuring a representative sample is the first step to preventing survey bias. For example, daytime-only phone surveys reach stay-at-home parents or non-working people, so results won't represent your target audience as a whole. Web surveys are limited to those with Internet access and are not necessarily representative of the range of residents in your target audience.

- **Non-return bias**

If a large number of people fail to respond to your surveys, bias toward those that did respond is introduced. Be sure to use up-to-date addresses and phone numbers. If your survey is short, concise, and attractive and you promise to make the results of the survey available to each participant, you are more likely to get responses.

- **Leading questions**

Do not ask leading questions that indicate the preferred answer. When you state what you think, the person might feel that you're introducing bias into any subsequent answers. People are reluctant to disagree with the interviewer's "authority." An example of a leading question: "You know that using a lot of fertilizer on your lawn is bad, right?" The participant might not have known that the overuse of fertilizer is not recommended, and this information could cause him or her to answer the rest of your questions based on the assumption that he or she knows the consequences of fertilizer overuse.

- **Question misinterpretation**

When talking to respondents, speak in their language; this draws them out and helps you understand how they truly feel. Avoid questions that can be answered with a simple yes or no. You can elicit more information from respondents using open-ended questions, which encourage them to talk and provide salient details. However, phrase questions so that the respondent understands them easily. Long, complicated questions will quickly lose the participants' interest, and they might skip the survey entirely. Keep in mind that answers to open-ended questions take more time to evaluate once the survey is complete, which can increase your costs.

The City of San Diego conducts telephone surveys every year to gauge the community's awareness of stormwater pollution prevention. After asking to speak to the youngest person over the age of 18, the questions turn to the sources of polluted runoff and how the citizen might or might not be contributing to the problem. The questions are concise and easily understood, allowing the respondent plenty of options and opportunity for additional comments. Once the data are collected, an outside market research firm provides a final report with findings and recommendations (available at www.thinkbluesd.org/literature.htm). The City is able to change the direction of its outreach program, if needed, based on the survey results.



To send an e-mail survey, you'll need a bank of e-mail addresses for members of your target audience. If you have an organizational listserver, you could use it, but this might bias the survey results because those participants are most likely already aware of and active in your cause. When you do send your survey, the e-mail can be either a plain text message (text-based survey) or an e-mail attachment (form-based survey created through Microsoft Word or Corel WordPerfect, for example). After recipients fill out the survey, they can send it back simply by replying to your message.

A Web survey will gather responses from citizens that have access to the Internet. Upload the survey on your organization's Web site and put plenty of advertising on the homepage. People visiting your site will have the opportunity to anonymously fill out the survey at their own pace.

Pros/Cons. E-mail surveys take a short amount of time, are self-paced, and provide the sender with fast results. Computer issues can cause problems, however, if a server goes down or if the user has problems downloading attachments. Web surveys assume that members of your target audience visit your Web site regularly. Keep in mind, however, that most visitors to your site might also be aware of the issues and your efforts. In addition, visitors to your site might not be in your target audience and could skew the survey results.

For more information on conducting surveys, see the boxes on pages 14 and 15.

Farmers' views on TMDL development and implementation

In response to a presentation at a local Farm Bureau to introduce water quality issues and TMDLs, the Yolo County, California, Resource Conservation District convened a focus group composed of area farmers. Their concerns, listed below, provide valuable context for outreach and education projects targeting agricultural activities and practices:

- We don't have time to come to meetings.
- We don't want a bunch of outsiders that know nothing about farming to tell us how to farm.
- We want to be the only decision-makers on these projects.
- There are issues of private property rights.
- How are we going to afford to make the changes in practices?
- We don't want to do something now and then have an agency come to us in a few years and tell us what we did was wrong and then have to change it.
- We don't feel there is enough scientific data in place to tell us what we should be doing.



—Katy Pye, Yolo Resource
Conservation District, California

Personal surveys

Surveys conducted in person (interviews) allow the interviewer to ask questions or administer the survey in a variety of ways (e.g., on the street, by appointment, in people's homes). However, they can also be time-consuming and labor-intensive. Potential interviewees must first be contacted to see if they're interested in participating. Then the survey must be conducted around the interviewee's schedule and availability. Interviews should be conducted at locations that are convenient and familiar to the participant, such as a local library or park or in the participant's home. If the participant is in a comfortable, familiar environment, you're more likely to get honest, in-depth answers. Interviews are effective for establishing rapport between the interviewer and the participant, which is especially important if the subject matter is sensitive.

Pros/Cons. Personal interviews allow the interviewer to record the participant's body language and tone during the interview, helping to gain a better understanding of the answers. However, personal interviews remove the anonymity that might have resulted in more honest answers in a phone or mail survey. In addition, having to arrange the interview around the participant's schedule and availability could draw out your collection effort for several months. Finally, the skills of the interviewer can make or break the interview.

Focus groups

Focus groups provide an opportunity to meet with several members of the target audience at once and allow them the chance to expand on comments and ideas. The focus group participants may be selected through surveys, recommended by a member of the target audience, or selected at random. Focus groups can also be formed based on demographics such as age group, place of residence, or occupation. Try not to accept volunteers because they are likely to already have an interest in the message. If possible, pay the focus group participants a small amount (\$10 to \$50) as an incentive to participate and to thank them. If you don't have the funds to pay them, at least provide food or other incentives.

Typically, up to 12 members of the target audience are asked to participate for 1 or 2 hours. Be sure to schedule the focus group at a time and place convenient for the participants. For example, many people have jobs during the day and are available to meet only after 5:00 p.m.

The focus group should be handled by an outside moderator to avoid introducing bias into the results. A series of questions are asked to the group, and the answers are recorded on flip charts or video/audio tape. Be sure to ask open-ended questions that result in detailed answers to collect as much information about the audience as possible. Remember that this is an opportunity to collect information, not to explain the issues to the group. Focus groups also enable you to start building a network of people you might be able to tap into later to help deliver your message.

Focus group checklist

1. Identify target audience. (4 months prior to selected focus group date)
2. Define goal of focus group. (2 months prior)
3. Determine payment amount and method. (2 months prior)
4. Compile mailing list for invitees. (6 weeks prior)
5. Identify moderator. (5 weeks prior)
6. Develop questions. (4 weeks prior)
7. Arrange and reserve session site. (4 weeks prior)
8. Write and send invitations. (4 weeks prior)
9. Follow up invitations with phone calls. (2 weeks prior)
10. Determine room arrangements (seating, audio/visual aids such as flip charts). (2 weeks prior)
11. Place reminder call to participants. (2 days prior)
12. Make arrangements for food or beverages. (2 days prior)
13. Conduct the focus group.
14. Distribute payments. (immediately after focus group)
15. Send thank-you letter to participants. (2 days after)
16. Review tapes or notes from focus group and summarize. (2 days after)
17. Analyze focus group summary and write report. (1 week after)

The value of building rapport in focus groups cannot be overstated. Telling the participants about the reason for the focus group, how the room is set up, and why there are microphones or observers makes the participants feel smart and valuable. Giving them ground rules such as “speak one at a time” and “avoid side conversations” or “respect the opinions of others” means that the moderator saves time by not having to play traffic cop later. Giving participants a reason for the discussion, e.g., “We’re going to talk about connections between human activities and environmental problems,” gives them an idea of what to expect, helps them access memory, and keeps the answers flowing freely.

Ask participants to introduce themselves using name, age, occupation, and where they live, and ask each participant a question related to the purpose of the focus group to allow the participant to feel more comfortable speaking in front of strangers and to see where he or she fits in the group. This process also allows the focus group moderator to create rapport with each participant through eye contact that demonstrates the moderator’s willingness to listen and openness to new ideas.

Strongly consider recording your focus group on audio or videotape to pick up on tone of voice or body language. Sometimes these auditory and visual clues can help you better interpret how the focus group participants feel about certain issues. Remember: Body language is 60 percent of communication. And if you plan to record the session, be sure to let the participants know in advance. If someone doesn’t want to be “on the record,” find another participant.

Choose a setting that is appropriate and makes the participants feel comfortable. What message does the setting send? Is it corporate, cozy, informal, or sterile? Does the setting encourage conversation? (For example, are the chairs arranged in a circle or are they facing one direction? Do what you can to the room layout to foster communication, such as rearranging the chairs.)

Pros/Cons. Focus groups can provide insights about the target audience’s composition, perceptions, and beliefs; provide interaction among participants; and build support for further actions or outreach communication. They can give community members a sense of inclusion in the community process by providing them with a forum to express their opinions. The disadvantages are that focus groups can accommodate only a few participants, the time demand on participants is considerable, and their success depends largely on the skills of the moderators. In addition, focus groups might not be suitable for certain cultures where peer pressure or deference to others could inhibit discussion.

Community/neighborhood discussions

Community discussions are somewhat similar to focus groups, but they involve more people, are more open-ended, and can be less



focused. Speaking directly with the target audience is a great way to get information straight from the source. A community discussion might involve citizens that have volunteered for the discussion or are in attendance because of a prior commitment. For example, many homeowners' associations and local communities hold public meetings quarterly and are willing to spare some time to discuss important community issues. If your group has the funds and resources, you might choose to rent space in a nearby hotel or community center and advertise a meeting devoted to your organization's needs.

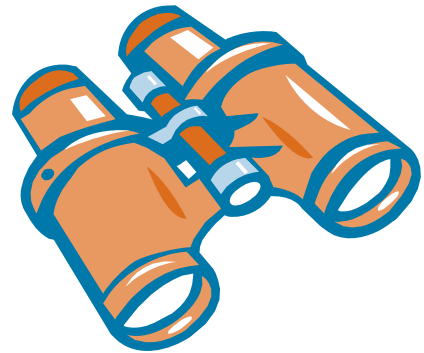
Schedule discussions on weekday evenings and weekends to attract working and nonworking residents. Try to get as much information as you can in as short a time period as possible because your attendees are likely to have busy schedules. Be sure to develop an agenda, stick to it, and have someone serve as a timekeeper to keep things on track. Allow a short amount of time after the meeting for individual questions and concerns. You may also want to bring surveys and questionnaires with you for residents to fill out and drop off or send back.

Pros/Cons. A community or neighborhood discussion will help your organization gather information directly from affected residents. You won't have to wait for results because you'll get immediate responses from attendees. On the other hand, these types of meetings typically attract people already interested in the subject. You might not reach any citizens who don't know about your issue. Piggybacking on existing meetings will help you avoid this bias because the meeting attendees will have come to talk about other things.

Observation

Observing how the target audience behaves can help you gain insight on people in your target segment and ways that you might encourage behavior change. This method helps you get a picture of what people actually do, as opposed to what they say they do. When asked, most people say that they care about water quality and believe that protecting it is important. When observed, however, those same people might be found dumping motor oil down storm drains or not picking up after their pets. Observations can be made during or after the behavior is completed. During the behavior, the observer makes notes about what triggered the behavior, how much effort the person exerted for the behavior, and what behaviors (facial expression, body language, etc.) accompanied the target behavior.

Pros/Cons. Observing what people do instead of listening to what they say they do is a good way to get a clear picture of how people behave. However, observing how they behave in certain situations can be viewed as an invasion of privacy. Be sure that all observations are carried out in public locations. If the people you're watching notice you, explain what you are doing and why. Often you might have to observe people for hours before you see them engage in the target behavior, if at all; thus the time commitment for this method is unpredictable.



For more detailed information on community cultural assessment, obtain a copy of EPA's *Community Culture and the Environment: A Guide to Understanding a Sense of Place* (EPA 842-B-01-003) from the National Service Center for Environmental Publications at 1-800-490-9198 or e-mail ncepiwo@one.net. It's also available in PDF format on the Web at www.epa.gov/ecocommunity/pdf/cccomplete.pdf.

Community cultural assessment and characterization

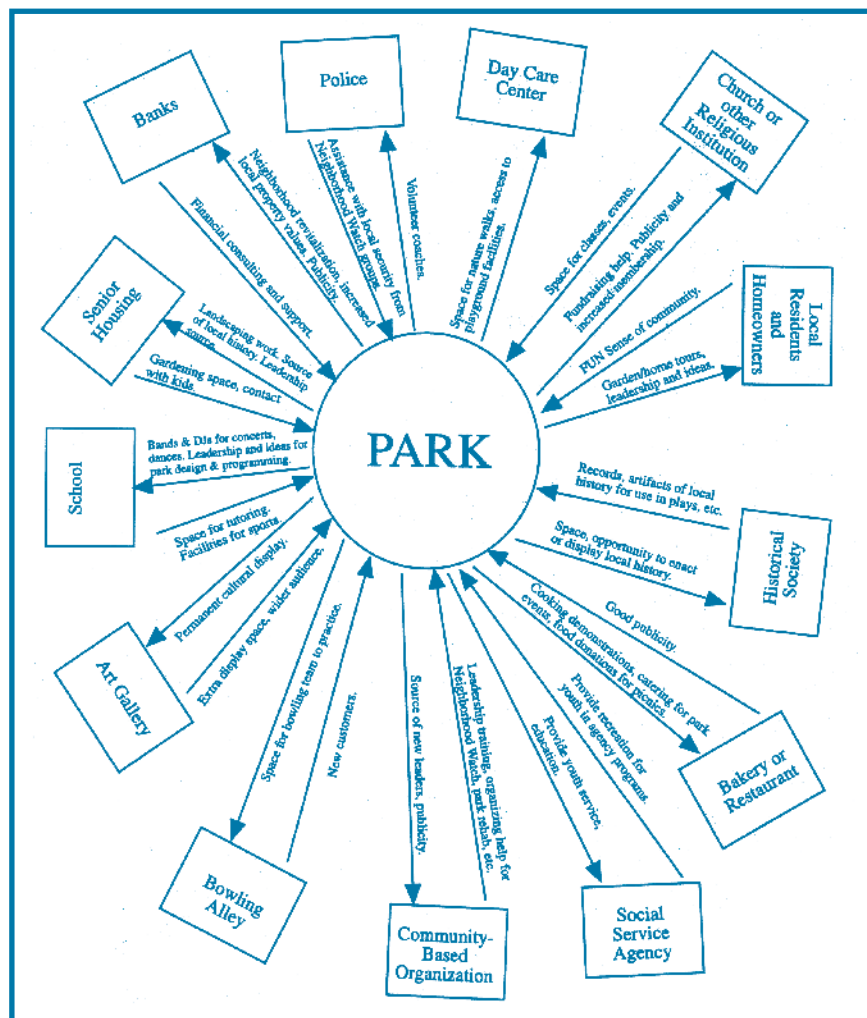
Understanding the social and cultural aspects of a community can be very important when there's no baseline information on the target audience. For example, if you've just moved from San Francisco to accept a job as a watershed coordinator in a small town in West Virginia, you might not fully understand what makes the citizens in your new hometown tick. The things that San Franciscans care about and what motivates them to act might be quite different from what you'll find in West Virginia.

Cultural assessment and community characterization are also useful if previous efforts at reaching and motivating the audience have failed. A cultural assessment doesn't just describe the community's makeup. It goes a step further by analyzing the cultural and ethnic preferences, beliefs, and attitudes present in the community. You can carry out cultural assessments by collecting and analyzing cultural information on your community obtained through state and local social service agencies; education agencies; the U.S. Census Bureau, U.S. Bureau of Labor Statistics, and U.S. Department of Housing and Urban Development; and annual

reports prepared by cities, counties, and states. Cultural demographic information can also be researched through all of the methods already discussed in this section (e.g., focus groups, community meetings). Once you know and understand the types of cultures present in your community, you'll be better able to craft messages that resonate with members of each culture, select appropriate formats, and determine the best distribution methods.

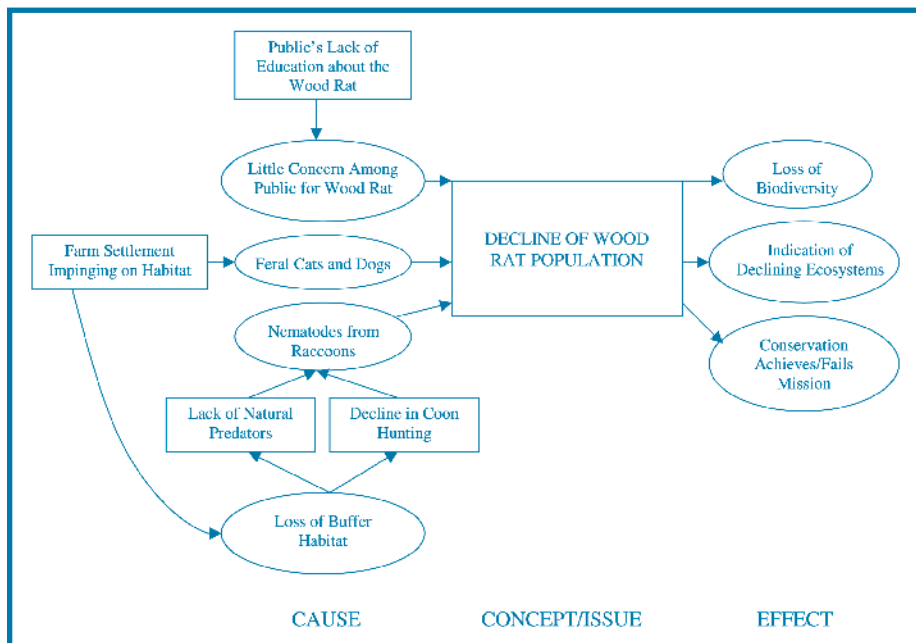
Collecting information to characterize the community might help you understand why past outreach efforts might have failed and what can be changed to achieve your objectives. In addition, if your goal is very broad, such as raising general watershed awareness, characterizing your community members might help you to better focus your objectives based on who talks to whom in the community, how information flows through its members, and how individuals view their community and watershed issues. Characterizing the community will help you answer key questions about the community's values, attitudes, and beliefs and how they relate to your organization's goals and objectives.

Asset Map



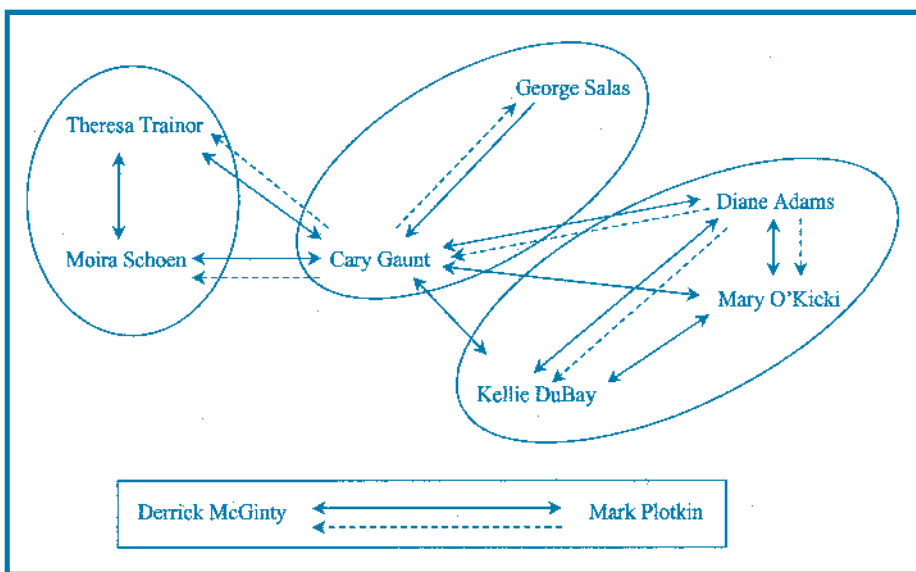
Source: *Community Culture and the Environment: A Guide to Understanding a Sense of Place*, U.S. EPA, 2003.

Concept Map



Source: *Community Culture and the Environment: A Guide to Understanding a Sense of Place*, U.S. EPA, 2003.

Social Network Map



Source: *Community Culture and the Environment: A Guide to Understanding a Sense of Place*, U.S. EPA, 2003.

Concept maps

A concept map identifies the relationships between causes and effects of environmental problems, such as the link between land use decisions and nonpoint source pollution. Your organization might ask community members to draw a concept map depicting their thoughts on how nonpoint source pollution occurs in their community. Once the map is finished, you can see what stereotypes might be present in your community, what perceptions create barriers to change, and where you might need to focus your campaign's attention.

Social network maps

A social network map will help you learn how information is disseminated throughout the target audience. It describes patterns of communication, relationships, and information flow. Participants depict their own personal social networks and then compare them with those of the rest of the group. You can tailor your distribution methods to fit with how members of the target audience currently communicate. Using social network maps will show you to whom people go for advice in the community (opinion leaders), who is the most "connected" in the community (information disseminators), which individuals or groups bridge gaps between different social groups (gatekeepers), and which individuals or groups are isolated from the rest of the community and thus might require more education and awareness before they can be expected to take action. Some groups could be isolated by language barriers, customs, or beliefs.

Social network mapping may be especially valuable for small communities or rural areas because those populations are often less segmented.

Pros/Cons. The largest obstacle to conducting mapping exercises is the need for group participation. Mapping is not very effective unless

several members of the target audience help create the maps. Asset mapping is particularly useful for large groups of people, where visual and easy-to-understand graphics enhance communication and the expression of community values. Cognitive mapping allows you to see the community through the eyes of members of the target audience. In addition, participants get the chance to analyze the data, which might provide unique insights that only members of the target audience could provide. One of the disadvantages of cognitive mapping is the tendency of people to spend too much time on the artistic quality of the map instead of its content. A concept map is a great way to show the relationship between both the perceived and real-life causes of problems and the associated effects on the environment. Social network mapping might be useful in large communities where information flow among members of a diverse target audience might be poorly understood by project leaders.

Analyzing and understanding the audience

Now that you've identified the target audience and collected some information about them, you need to analyze and understand them. What drives them to engage in the behaviors you'd like to change? What are the barriers to modifying their management practices or behaviors? Learning the answers to these questions will help you understand how your audience thinks and how you can tailor your message to motivate changes in behavior.

Barriers to action: Why do they do what they do?

There are many reasons why people do not choose sustainable behaviors. They might simply be unaware of the impact their behavior has on water quality. They might believe that doing the right thing is too expensive, takes too much time, is inconvenient, or is socially unacceptable. And unfortunately, when it comes to the environment, most people simply do not believe that a change in the personal routines and habitats of just one person will make a difference. These reasons are called barriers. Barriers prevent people from taking positive steps toward improving the environment. Barriers can be physical (such as the lack of facilities to collect household hazardous waste), economic (high cost), psychological (a perception that lush lawns are prized), or knowledge-based (lack of understanding of how to conduct a soil test). These obstacles must be minimized or removed so that the benefit outweighs the cost or effort of the action.

To address these barriers, you need to think about what motivates people not to engage in environmentally friendly behavior. For example, many people do not pick up after their pets. Most think that pet waste is a part of nature and that it biodegrades quickly. Many even view it as fertilizer. They don't realize that dog droppings are one of the leading causes of pathogen contamination in streams; each gram

Mapping resources

Decision Explorer: Getting Started with Cognitive Mapping by Fran Ackermann, Colin Eden, and Steve Cropper
www.banxia.com/depaper.html

Mental Maps by Peter Gould and Rodney White
Available from Routledge Publishers
www.routledge.com

Understanding barriers

Audience research conducted by Toronto's Public Health Office uncovered many barriers to widespread implementation of integrated pest management (IPM) practices by landlords, building managers, and residents, including the following:

- Limited knowledge of IPM
- Lack of trust in IPM's effectiveness
- A misunderstanding that IPM costs more than traditional spray methods
- An expectation of immediate elimination of pests
- The stigma associated with cockroaches, making information-sharing difficult
- Poor understanding of factors that contribute to pest infestations
- Lack of awareness about health risks associated with pesticide sprays

Armed with this information, health officials developed a comprehensive education campaign that ultimately led to a reduction in the amount of pesticides used by the target audience.

For other cases studies like this one, visit www.toolsofchange.com, a Canadian community-based social marketing Web site that includes more than 70 case studies on community programs across North America.

Survey says: Neighbors' opinions matter when it comes to lawn care

In 1999 the Survey Research Center of the University of Georgia conducted a telephone survey of homeowners on behalf of the Pollution Prevention Assistance Division of the Department of Natural Resources. The purpose was to assess the attitudes of Georgians toward a variety of topics related to lawn and landscape maintenance that affect environmental pollution.

The surveyors found that more than half of those polled considered it moderately to very important to have a yard appearing as attractive as their neighbors' yards. In addition, they learned that the principal source of gardening information used by Georgia homeowners is friends and neighbors (64 percent), followed by television (60 percent).

of dog poop has more than 20 million *E. coli* bacteria colonies in it (not to mention the nitrogen and phosphorus it contains). Others believe they don't have time to stop and scoop or that it is just too unpleasant. Researching your audience to understand the barriers to getting people to pick up pet waste in their yards, on the beach, or wherever they walk their pets will help you craft your message to change their perceptions. Your message might include a photo of someone walking their dog on a beach where children are playing in the sand. Overcoming the perceived barriers to scooping the poop will result in more people changing their behavior. Appendix B provides a worksheet that will help you identify the barriers to adopting the behavior you're promoting and tips on how to overcome or reduce those barriers.

Social norms: Everyone's doing it!

Social norms are the standards of attitude and behavior perceived as normal, acceptable, and expected among the members of a community. For example, because most people buy red, white, black, or green cars, it becomes socially unacceptable to buy a hot pink car, even if hot pink is your favorite color. Car manufacturers don't even make cars in hot pink because they know people won't buy them. Social norms affect environmental issues in much the same way. If everyone else on your street maintains a bright green lawn by putting down lots of fertilizer four times a year, you're likely to follow suit whether your lawn needs fertilizer or not, feeling that you'll be judged by your neighbors if your lawn is not as green and lush as theirs.

So how can social norms be overcome? Outreach campaigns should be structured so that they give people new norms. They should inform people of the new acceptable behaviors. The agricultural community does this through farm demonstration projects. Farmers are more likely to adopt a new practice if they've seen that a neighbor is doing it and is benefitting from it. In addition, many manufacturers have become partners in a growing effort to reward sustainable behaviors through eco-labeling. Buying products labeled as ozone-friendly or recyclable makes people feel good about themselves and shows other buyers that they are environmentally savvy. Bumper stickers, T-shirts, and other rewards for environmental behavior are often great ways to establish new environmental social norms in your community. The goal is make it unacceptable to continue the behavior that has negative effects on water quality.

Critical mass

As mentioned previously, sociologists have found that when a new idea or behavior is adopted by roughly 15 to 20 percent of the audience, it will then have the critical mass it needs to permeate the rest of the audience, by word of mouth and observation. This social diffusion can be achieved by identifying the innovators and early adopters in the community, who are the most likely to try something different. Use them to set the new trend.

The roles people play

People engage in different behaviors based on the role they're playing at the time. Whether they're acting as parents, environmentalists, business owners, or developers makes a difference in what sustainable behaviors they'll adopt. When developing your outreach campaign, you might want to create different messages to address the different roles people have or use different formats and distribution mechanisms to reach them in those roles. If you're having trouble getting business owners to adopt recycling practices, for example, approach them as homeowners first. They might be more likely to overcome their perceived barriers to recycling at home before they're willing to do it at work.



Building Blocks: Target Audience

One of the objectives of the hypothetical Herndon County's watershed management plan is to reduce nutrient runoff coming from residential areas. The county's watershed planning committee agreed that focusing their efforts on reducing nutrient runoff will greatly improve water quality in the county. The county identified two audiences that need to be reached to reduce residential nutrient runoff: (1) homeowners and (2) homeowners' associations and apartment/condominium landscape managers. Two focus groups were held for each group in different parts of the county. In the focus groups, the county learned the following:

- Local garden and lawn supply stores recommend fertilizing twice a year
- Most homeowners get advice on lawn care from neighbors, friends, and family
- Busy schedules prevent many homeowners from taking an active role in environmental efforts
- Many residents have attended gardening workshops at the local community college
- Apartment/condominium landscape managers fertilize three times a year
- Apartment/condominium landscape managers are driven by the need to attract new residents with lush green lawns
- Both homeowners and apartment/condominium landscape managers are interested in protecting water quality

In addition, to measure awareness levels and to understand current lawn care practices, county staff conducted a random-digit-dialing survey of county residents. They learned that only 25 percent of county residents were aware that lawn fertilizer is a significant contributor to local water quality degradation.

Financial incentives

Financial incentives can also change the behaviors of people who believe that protecting the environment is too time-consuming or expensive. The new “Get Green” campaign, developed by the environmental advocacy group Environmental Defense and produced by the Ad Council, uses humor to offer viewers simple, everyday ways that they can help the environment. Get Green highlights how people can help the environment “get green” while helping themselves “get green” by saving money. Five TV public service announcements (PSAs) humorously depict the simplicity of incorporating environmental actions into daily lives. One PSA shows a man inflating his tires properly and saving money on gas. “Yeah,” he says. “I save Mother Nature from pollution. But more important, she’s already saved me 30 bucks!” Another shows a man who has just had his car tuned. It conveys the same message—saving the environment while saving money.



PROCESS CHECKLIST

Step 2: Identify and analyze the target audience

- ☐ Have I defined the audience in a way that separates it from the general public?
- ☐ How many target audiences or segments have I identified?
- ☐ Have I identified the opinion leaders, information disseminators, and gatekeepers in the target audience?
- ☐ Have I segmented the target audience so that I can develop messages for each subgroup?
- ☐ Is the target audience for each objective sufficiently defined?
- ☐ Have I identified the communication channels used by the target audience?
- ☐ Have I collected enough data on the target audience?
- ☐ How long will it take to collect survey data on the target audience?
- ☐ Do I understand the target audience?
- ☐ Do I know what is important to the target audience?
- ☐ Do I know what barriers prevent the target audience from changing its behavior?
- ☐ Are there barriers to accessing the target audience that can hinder the plan?

Step 3: Create the message

After gathering information on members of the target audience, you're ready to craft a message that will engage the audience's members and help achieve your water quality objectives. To be effective, messages must be understood by the target audience and appeal to the people on their own terms. Your message should be clear, specific, and tied directly to something the target audience values. In addition, the message should articulate what actions the receivers should take. These actions might include letting vegetation grow taller along a stream, pumping septic tanks, or conducting soil tests before fertilizing lawns. Messages that are vague or that don't contain specific calls to action—"We all contribute to nonpoint source pollution"—might help to build general awareness but are ineffective at changing behaviors.

Remember that your message is not simply a restatement of your objective. Your message will help achieve your objective, but the two are not the same. Objectives describe final results; messages prompt the knowledge, attitudes, and actions needed to obtain them.

Crafting the message

Messages are designed to raise general awareness, educate, or motivate action. If people aren't familiar with an issue or problem, awareness and education will have to precede any calls for action. For example, it is unrealistic to expect voters to approve a stormwater management bond referendum that will raise their property taxes by 4 percent unless they know what the money will be used for, why the expense is necessary, and who will benefit. Awareness and education activities—discussing the inadequacies of the current stormwater system, perhaps, and reviewing possible improvements—are usually required before asking people to take an action that will cost them time, resources, or money.

A careful analysis of your overall goal (e.g., improve water quality) and supporting objectives (e.g., reduce nutrient loadings, control sedimentation) will help you determine the best way to craft a message for the target audience. A variety of approaches are available. For example, in some cases the message might stress what



What's in Step 3

- Crafting the message
- Getting their attention
- Getting a response
- Using incentives and rewards
- Focusing on behaviors
- Message delivery

Messages already out there...

- After you flush, it just doesn't go away—*City of Portland, Oregon*
- Clean water, a bargain at any cost—*Water Environment Federation*
- Water Watch: What boaters can do to be environmentally friendly—*National Marine Manufacturers Association*
- Are you contaminating your drinking water?—*EPA*
- Pollution prevention: it's everyone's job—*U.S. Department of Energy*
- The Bay begins at your front door—*Santa Clara Valley Nonpoint Source Pollution Control Program*
- Our environment... begins with your yard—*Virginia Department of Forestry and City of Virginia Beach*
- Go with the flow—understanding watersheds—*New York State Department of Environmental Conservation*
- Scoop the poop—*City of Austin, Texas, and Anchorage Waterways Council*
- Please don't feed the storm drain—*Texas Commission on Environmental Quality*



In Pennsylvania Amish country, convincing dairymen to fence their cows out of the stream worked only when the message appealed to the dairymen themselves. Creating a message that focused on herd health or other issues that the dairymen were interested in is what really worked.

Discussing your goals and objectives with members of the target audience through individual contact, focus group meetings, or audience research is highly recommended when developing the message.



Check out the Getting In Step video.

might be lost if the desired actions are not taken (water quality), rather than individual benefits (increased sense of social responsibility). Other approaches include highlighting potential threats, appealing to a common vision for improved conditions, and portraying the targeted behavior as cool, sophisticated, or otherwise desirable. Always pretest your message on a subset of the target audience and adjust it as necessary. Keep in mind that if your message is focused on getting people to take a specific action, they will be more likely to take part if the message also has a component that helps build awareness at the same time. A message like “Don’t dump used motor oil down the storm drains” is much more effective if you add “because our storm drains drain to the bay.” According to *Fostering Sustainable Behavior* by Doug McKenzie-Mohr and William Smith, campaigns should simultaneously inform and suggest acceptable behaviors. People tend to do the right thing when they observe others doing it first. An example in *Fostering Sustainable Behavior* describes a group of psychologists performing a study on norms and recycling in 1990. They placed flyers on every windshield in a library parking lot. When a person was seen throwing the flyer in a trash can, no one else littered. When the person threw the flyer on the ground, over one-third followed suit.

Messages can appeal to the audience’s hopes, fears, sense of responsibility, or personal benefits. Exploring the attitudes, perceptions, and beliefs of the audience regarding the subject of your message (through the research conducted in Step 2) can help you uncover messages that will resonate with the audience members. For example, a land manager might be more interested in the amount of time and money he can save by scaling back his existing mowing program than he is in the amount of nutrients and sediments trapped by the resulting vegetation. One developer might be most interested in complying with local erosion and sediment control ordinances and avoiding fines, whereas another might want to preserve habitat in an area of the river she fishes.

Be careful not to create a message that will easily become outdated. If your message involves getting people to support a new zoning ordinance that protects riparian corridors, you might be wasting your time if that ordinance is being spearheaded by a local politician who could be ousted in the next election. Don’t ask residents to have their septic systems inspected if sewer lines are expected to be extended to their area within the next year. Make sure your message won’t fade with current events or changes in administration. Consider omitting dates from print materials if they will be used for years to come.

The language and style of the message should match those of the target audience. If you’re unsure about the reading level of the target audience, pretesting the message with representatives of the audience to determine its appropriateness will help. Consider displaying the message graphically if the target audience is not fully literate. If the

target audience's primary language is not English, lead off with their native language first and include an English version underneath, if needed. Always seek to understand and to be understood.

Getting their attention

Of course, the message will need to capture the attention of the target audience. Cutting through the clutter of the daily news, school schedules, work commitments, and social outings to grab the audience can be difficult. You need a hook—a way to make the message both lively and personal so that it resonates with the audience and prompts them to respond. The “package” or format of the message can help with this, but the message itself must command attention if it is to be acknowledged.

Effective hooks vary according to the audience. Technical audiences might be drawn to detailed trend charts, modeling results, or data displays on the effectiveness of best management practices (BMPs). Developers might want to know how much bang they're getting for their buck—what's the relative effectiveness of the proposed control measure, and how much will it cost? More general audiences might be engaged by information linked to the local drinking water sources or messages that have powerful emotional connections. The challenge will be finding a way to engage the audience directly without resorting to hyperbole or other inappropriate distortions.

Humorous messages can also attract attention. Keeping your message lighthearted makes people feel more comfortable with the topic and helps them feel less intimidated. For instance, if you're trying to generate stakeholder interest in providing input on a new watershed management plan, you might hold monthly backyard barbecues with the message “Come Grill Us About Your Watershed!”

Analogies or stories that vividly portray the scope of a problem, compelling questions, and appeals that stress rewards or threats can all help grab the attention of the target audience. For example, consider the following set of approaches for presenting similar information:



Less vivid	More vivid
There are about 26 million septic systems in the United States.	Septic systems treat and release about 4 billion gallons of wastewater per day.
Every month about 6,000 cubic yards of sediment is transported down the Red River.	The Red River carries the equivalent of 1,000 pickup truck loads of dirt every month.
Hog production in the five-county area generates approximately 750 tons of manure per day.	Hogs in our coastal counties produce more manure each day than a city of a half-million people.
Population is expected to increase about 15 percent annually over the next 5 years.	We'll need to build 10,000 homes, 6 schools, and a hospital by 2008 to keep up with current growth trends.

Using the information you collected on the target audience in Step 2, determine what will get this group's attention. Talk to people knowledgeable about the audience, convene focus groups of audience members, or research how others targeting that audience develop their outreach or marketing materials. Focus groups are particularly good venues for testing and obtaining feedback on various versions of outreach materials, messages, and other aspects of the effort. In a focus group conducted by EPA in 2001, participants mentioned that messages that clearly and dramatically demonstrate the immediate cause-and-effect relationship between personal polluting behaviors and resulting pollution are most effective. Messages aimed at educating teenage audiences must include elements that target that age group: the messages should be bold, hard-hitting, irreverent, and provocative.

Striking a balance between engaging the audience with a compelling hook and putting them off with hype, overwrought threats, or scare tactics requires careful consideration of the objective, the message, and the audience. Take time to explore how your message will be received and what reaction it is likely to evoke before you finalize and release it. Don't overwhelm your audience by trying to cover too many bases in one message. Keep it simple so the idea is not diluted. Delivering too much information at once doesn't work, even if you're addressing a complex issue.

Getting a response

Ask people to do something in your message, and let them know why it's important. It's not likely that they will do anything unless you specifically ask them. Below are some action steps an outreach campaign might promote:

- *Recycle your motor oil at any auto parts store in town.*
- *Seed and mulch bare ground within 14 days after removing vegetative cover.*
- *Save plastic grocery bags, and use them to scoop the poop from your pooch.*
- *Have your septic system inspected every 3 years and pumped as necessary.*
- *Make your lakeshore a no-mow zone!*

When asking people to take action, be very clear about what they should do, and make it easy to remember. Think about what behaviors are currently the norm and what behaviors you hope to make the norm. If you can reinforce the desired behavior by noting others who are engaging in it, so much the better. For example, farmers are much more likely to upgrade their livestock waste management practices if others are doing it. Asking people to take action is where the rubber meets the road in the world of voluntary BMPs. In many cases, your whole water quality improvement effort might be based on convinc-



ing X number of people to take Y number of Z actions. If this is the case, your outreach strategy needs to explore very carefully what type of appeal is most likely to work.

Make sure your message includes achievable personal goals, such as having your car inspected for leaks every 3 months. Reasonably achievable goals are more likely to be reached by small behavior changes that you might suggest. Provide incentives and rewards to encourage people to change their behaviors. Keep in mind that you're trying to get people to actually do something. Activities like distributing brochures, hosting workshops, placing ads on the radio, and holding field days are supporting tasks, not the objective itself!

Messages with incentives and rewards

Using financial incentives is one of the best ways to get people involved in your cause. Financial incentives are best used when research on the target audience suggests that people are unlikely to change their behaviors without an incentive. For example, providing discount cards from local businesses for participating in a household hazardous waste recycling event might encourage a few more residents to participate than would have otherwise. Other examples include paying homeowners a small stipend for agreeing to participate in focus group meetings, offering rebates for purchasing low-flow showerheads, and offering subsidized interest rates or tax breaks. Be sure that you build in ways to make people notice your incentive. Include information on financial incentives at the point of sale or in bill inserts so that people notice them at times when they are already thinking about money.

On the other hand, disincentives, such as fines for overwatering or cutting down trees within 50 feet of a stream bank, discourage people from taking actions you want them to avoid. Disincentives, like the rising cost of water due to high wastewater treatment costs, can be mentioned in printed materials and on radio and TV.

Bear in mind that when people are already motivated to change their behaviors, the use of financial incentives could undermine their motivation. In addition, if the incentive is taken away later on, that original motivation might be lost.

Deciding which behaviors to focus on

To create messages and encourage actions that will help you achieve your overall water quality objectives, you need to decide which behavior changes will give you the most for your money. Will you gain a greater reduction in overall sediment pollution by asking developers to avoid projects along streams and waterways or by asking construction site managers to plant vegetated buffers along stream banks? Which behavior change will be easier to measure? Which one is the



Free mowers mean more natural lawns

Every April King County, Washington, cosponsors a program to offer discounts on mulching mowers. The program began in 2000 when the county asked one local neighborhood to forego lawn chemicals and embrace grass mulching. Each of the households in the neighborhood was given a free Black and Decker electric mulching lawn mower (donated by Black and Decker), free lawn care consultations, and free environmentally friendly lawn care products. In return, residents were asked to pull weeds by hand, water their lawns less, and dispose of all their chemical pesticides.

(<http://dnr.metrokc.gov/swd/ResRecy/events/naturallyard.shtml>)

audience more likely to adopt? Which behavior shows the most direct link to the problem? Which will be the easiest to promote, financially and technically? What barriers need to be overcome to motivate people to engage in that behavior? Thinking about these questions will help you choose the behaviors you should target in your campaign.

To make the behavior selection process easier, use a table like the one presented on page 34 for the Building Blocks case study box. A blank matrix is provided in Appendix C. By answering the questions in the table, you'll be able to score the potential behaviors you're considering and decide which behavior you should focus on to meet your goals and objectives. For example, when answering the question "Which behavior will be the most affordable to promote to my audience?", be sure to consider both the short-term and long-term costs you might incur while trying to encourage the adoption of each behavior. Think about the costs of outreach materials and formats, how the materials will be distributed, and who will help you distribute them. If the cost to promote a behavior is particularly high, you might want to focus on another behavior that will achieve the same result. The answers to most of the questions in the table will be found during the target audience analysis process you conducted earlier. Having focus group participants complete the table together is also a good way to zero in on behaviors. For each question, rank each behavior, starting with 1 as the behavior least likely to result in the best outcome for that question. Hints on how to answer the questions are provided in Appendix C along with a blank matrix.

Zeroing in on behavior through social marketing

As discussed in this guide, community-based social marketing is the most effective way to encourage behavior change. One of the leading experts on social marketing, Dr. Doug McKenzie-Mohr, an environmental psychologist specializing in designing programs to promote sustainable behavior, published *Fostering Sustainable Behavior: An Introduction to Community-Based Social Marketing* in 1999. Dr. McKenzie-Mohr's approach involves identifying barriers to a sustainable behavior, designing a strategy that uses behavior change tools to overcome barriers, piloting the strategy with a small segment of a community, and evaluating the impact of the program once it has been implemented across a community. The behavior selection matrix on page 34 follows a similar path in that it is designed to help organizations choose the behavior that will be the easiest or most important to change.

For more information on Dr. McKenzie-Mohr's work, visit the McKenzie-Mohr & Associates Web site at www.cbsm.com.

Message delivery

The next section (Step 3) discusses formats and delivery mechanisms for your message; that is, how to get the message packaged and distributed. It's helpful to give some thought to message delivery when you're crafting and refining your message because the way it's delivered can significantly affect what happens next.

For example, outreach messages targeting business owners are better received and more powerful if a member of the business community delivers them. Integrating personal communication with a member of the target audience or another person during message delivery increases the chances that the desired action will be taken. Personal involvement can also help model the desired behavior and provide additional outreach and support for the message—and the target actions—after the initial outreach phase has been completed.

Building Blocks:

Creating the Message

One of the objectives of the hypothetical Herndon County's watershed management plan is to reduce nutrient runoff coming from residential areas. The county's public outreach committee agreed that focusing their outreach efforts on homeowners, homeowners' associations, and apartment/condominium landscape managers would greatly improve water quality in the county.

To help the committee members decide which behavior changes would give them the greatest benefit, they developed a behavior change matrix to compare six nutrient-reducing behaviors. The committee scored each behavior based on the results of the research it had conducted when identifying and analyzing its target audience. The behavior that received the highest score, reducing the number of times fertilizer is applied each year from twice to once, is the behavior the committee decided would provide the greatest reduction in nutrient runoff, considering the inclinations of the target audience. The matrix is shown on the following page. (See Appendix C for instructions and a blank matrix for you to use.)

After the committee selected which behavior to focus the campaign on, the county set out to create its message. From Step 2 (Identify and analyze the target audience), the county had learned that although many residents are interested in protecting the environment and their water resources, most simply do not have the extra time to take action. The county knew that it would be important to stress that reducing fertilizer application would save residents time and improve water quality while giving them a healthier lawn at the same time. The outreach campaign's message became the following:

Fertilize in the Fall. That's All!

With slow-release or organic fertilizers, you need to fertilize only once in the fall to help your grass grow new roots and store nutrients for next year's growth.

Sample Behavior Selection Matrix

Water Quality Objective: Reduce nutrient runoff from residential areas

Evaluation Questions										
Score from 1 to 6 (1 being the least likely; 6 being the most likely). Note: Behaviors may receive the same score if applicable.										
Behavior	Which behavior will result in the highest reduction in pollution?	Which behavior will be the most affordable to promote to my audience?	Which behavior will be the most affordable for my audience to adopt?	Which behavior is the most attractive to the people in my community?	For which behavior will it be easiest to show a link to the problem?	Which behavior is the most sustainable?	Which behavior will have additional water quality benefits?	Which behavior will get the highest consumer response?	Which behavior has the fewest barriers to overcome?	Total Score <i>(sum of columns 1–9)</i>
Pick up pet waste	4	6	5	1	5	4	1	6	6	38
Reduce fertilizer application from twice a year to once a year	6	5	6	3	6	5	6	3	5	45
Plant streamside vegetation to filter out nutrients	5	2	2	4	1	6	6	4	2	32
Have septic systems inspected every 3 years and pumped as necessary	3	1	1	2	4	3	5	1	1	21
Leave grass clippings on the lawn	2	4	4	5	2	2	3	5	4	31
Plant native plants that require less fertilizer	1	3	3	6	3	3	4	6	3	32

Instructions:

1. Score each behavior based on the evaluation questions (1 being the least likely; 6 being the most likely).
2. Total each behavior score by adding the scores for each question.
3. The behavior with the highest score is the recommended behavior.

Note: The results of this matrix will vary between communities. The factors may change depending on input from the target audience.



PROCESS CHECKLIST

Step 3: Create the message

- ☐ Is the message relevant and accessible to the target audience?
- ☐ Is the language of the message appropriate to the target audience?
- ☐ Is the message specific for each audience, and will it resound with each?
- ☐ Can the message be understood by the target audience?
- ☐ Is the message vivid and memorable?
- ☐ Have I included personal goals in the message?
- ☐ Have I road-tested the message with members of the target audience?
- ☐ Can the target audience respond to the message in an easy, convenient way?
- ☐ Have I successfully identified which behaviors to ask the target audience to change?
- ☐ Does the message motivate behavior or attitude change?
- ☐ Have I considered how the message will be delivered?

Positives outweigh negatives

After engaging the members of the audience and exposing them to your message, you can provide other information you feel is important, such as environmental benefits. It's advisable, however, to let the audience members know first what their direct benefit will be. A word to the wise: Studies show that positive messages ("do this") tend to be more effective in changing people's habits than negative ones ("don't do this").

Step 4 Package the message

What's in Step 4

- Linking the audience and formats
- Considering formats
- Repeating the message
- Using the mass media
- Making videos
- Using print materials
- Conducting presentations
- Holding events
- Giveaways
- Mascots
- Using the Internet



You've defined the objectives, assessed the target audience, and crafted the message. Now it's time to determine the best package or format for the message for eventual delivery to the target audience. The information you collected in Step 2 will help determine the most appropriate format. A farming community might respond more positively to field day events, door-to-door visits, or articles in farm publications than to an Internet and e-mail campaign. When selecting your message format, think about where the target audience gets its information.

Linking the needs of the audience to the format

Making sure that you choose the right message format for the target audience is one of the most important steps in outreach. Several factors about the audience come into play:

- **Size of the audience:** If the target audience is large, a door-to-door campaign might not be feasible; if the audience is small, a grandiose community festival could waste valuable time and money.
- **Geographic distribution of the audience:** If the audience is widely distributed (such as across a rural county), presentations given at workshops might not be the best choice because participants would have to travel a long distance to get to them.
- **Level of awareness and education:** If the audience consists of new immigrants from non-English-speaking countries, newsletters or other written formats might not appeal to them; radio or TV public service announcements (PSAs) in their native language would be a better choice.
- **Preferred formats:** If the research you conducted on the audience revealed that most of the audience members have access to the Internet and use it regularly, a campaign-specific Web site might be an important element to include in your campaign.

Format considerations

In some cases, the format will define the distribution mechanism (newspaper articles, radio spots, public events). Keeping in mind the possibility of using multiple formats, consider the following:

- Is the package appropriate for the target audience?
- Is it user-friendly?
- Does it clearly communicate the message?
- How will the target audience access and use the information?

- Is it something they will see once and discard, or refer to often?
- Can it be produced in-house with existing resources?
- How much will it cost, and who will pay for it?
- Are there existing formats or templates that can be tapped into?
- Will it fit in a standard-sized envelope?

Keep in mind that the package and venue for any message are usually linked. For example, printed materials containing environmental messages are often criticized if they're not produced with high post-consumer-content recycled stock. Be mindful of the links between message, format, and distribution. In practice, this might mean announcing a river festival on brightly colored recycled paper or using a radio show on car maintenance to reach automotive do-it-yourselfers.

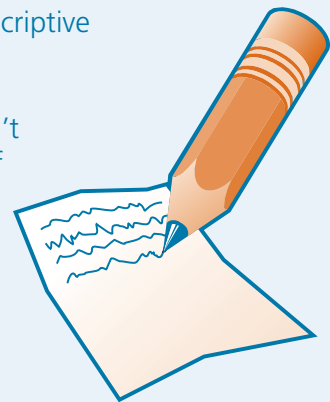
Repeating the message

In addition to being promotional vehicles for messages, formats often dictate the frequency of message presentation. Frequency is important because it determines how well the message will be remembered. Professional marketers know that the more times you

Sharpen your writing skills

There are no hard-and-fast rules or magical formulas for "good writing," but there are some solid guidelines that could add sparkle and strength to almost anyone's words.

- Make sure that your message targets the audience and will resonate favorably. Write simply and directly.
- Pay attention to grammar and punctuation, and avoid careless mistakes and typos. Consult a writing stylebook to double-check just where that comma or apostrophe should go, or ask someone with experience and a keen eye to edit the piece.
- Use the active voice.
- Write in simple declarative sentences. Make each word work. Avoid overuse of the thesaurus or your writing will sound stilted or pretentious. Use descriptive adjectives, but not too many.
- Make sure your writing conveys your intentions.
- Sometimes a new perspective and a fresh start are needed, so don't hesitate to start over if necessary. If you come down with a case of writer's block, you might be making too great a fuss over what you're writing. Sometimes it helps to just start writing, even if you begin at the middle or end of a piece. You can always go back and edit or enhance it later. Getting something on paper is the most important part.
- Avoid the use of technical terms, jargon, and acronyms unless the audience is familiar with them.



see their advertisement for a product, the more likely you'll remember the product and the more likely you'll buy it. Educating stakeholders and citizens on watershed or polluted runoff issues is no different: people remember what resonates with them and what is in front of them. As the saying goes, "out of sight, out of mind." So if your message is short, you might want to display it on a refrigerator magnet and keep it in front of the audience for months or even years. Other packages—rain gauges, calendars, Frisbees, news media pieces, printed materials, and so forth—all have their own pros and cons. Take time to explore them to see if they fit your program by linking objective, audience, and message.

Format options

The following is an overview of some popular formats; however, it is not meant to be comprehensive. Choose one format (or more) that helps achieve the desired result with the available resources. Combining formats can reinforce your message considerably. For example, promoting environmentally friendly agricultural practices through newspaper articles, farm field days, and "conserve our soil" ball caps can create interest in and support for such practices. Keep the target audience in mind while considering various formats.

If your campaign will last for a relatively long period of time, you have the option of using multiple formats over time. In fact, formats should change over the course of your outreach campaign to reflect the different phases of outreach—awareness, education, and action. This continuum calls for a broad, generic message at the outset to raise and increase awareness. As the target audience becomes aware of and interested in the issue(s), the messages and formats should become more specific. For example, generic radio and TV PSAs can lead into specific ads regarding pet waste, fertilizer use, and vehicle care.

Each format has advantages and disadvantages, and you need to weigh these as you decide which format will resonate most and is most appropriate for the target audience. Other considerations when choosing a format include cost, staff time needed, setup time, production time, schedule, legal requirements, and audience type, level of education, and involvement in the issue. The table on pages 40 and 41 lists some of the pros and cons of each format and the circumstances under which each format is best applied.

The following sections present the formats from the table and provide tips for increasing the effectiveness of these formats.

Mass media formats

If your message needs to be understood and embraced by the public, it must be covered by the mass media. The media are the most cost-effective and efficient way to get your message delivered. Partnering

with the news media—newspapers, TV, magazines, radio—is not difficult, but it requires some orientation and basic training on how to involve them in your outreach effort.

Opportunities to place your message in the media include informational news stories, people features, issue analyses, PSAs, interview programs, call-in shows, editorial columns, and feature items related to sports, recreation, or outdoor living. Each of these formats requires different techniques, which are discussed below.

Formats using the mass media can be broken down into two major categories: news coverage and advertising. News coverage includes interviews, news stories, letters to the editor, and event coverage. Advertising includes the development of PSAs. Publicity generated from news coverage is dependent on the news organization, whereas you create radio, TV, and newspaper advertising yourself. In many cases the advertising that you do can be leveraged later into news coverage. For example, one state bought informational ads on agriculture-related water quality issues from a country station and received as a benefit some free news coverage of the issues during the year.

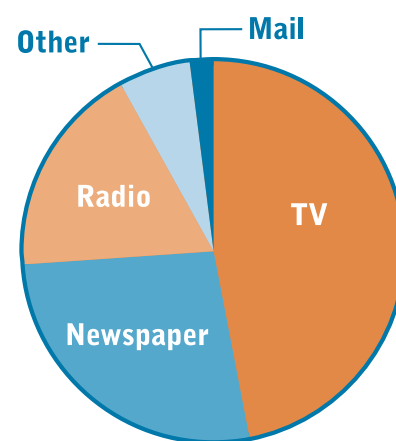
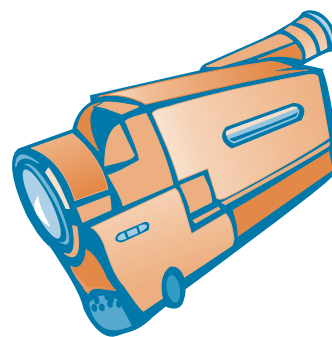
News coverage

Why use the news media?

Americans are voracious consumers of news and information, and information on water and other science issues is not much different from information on health, economics, or sports. A survey conducted by Lake Research, Inc., for the Upper Mississippi River Basin found that 47 percent of watershed residents get their information on river issues from local television news, 27 percent from local newspapers, and 18 percent from radio news. Only 2 percent of those surveyed mentioned environmental mailings as their first or second news source, and meetings didn't even make the list. Nearly every study conducted in the United States over the past decade has concluded that most people—even those involved in scientific or water resource issues—get their environmental information from the news media. Obviously, the news media have tremendous reach when it comes to communicating watershed messages to both targeted and broad audiences.

The news is free!

The news media are effective, available, and free. Surveys repeatedly show high public interest in environmental issues and in water quality, particularly as it relates to drinking water, public health, and recreational uses. Reporters are always looking for news—informative articles, features on people or issues, or regular columns—to fill their pages or broadcasts. Packaging your messages as news stories can help distribute your information to mass audiences at virtually no cost. You have to buy an ad, but placing your message in the news is free. The trade-off is that you do not control the message, timing, or frequency of the news story.



Sources of Environmental News

Choosing the Right Format

Format	Pros	Cons	Uses
TV news coverage	<ul style="list-style-type: none"> • Creates awareness, publicity, and recognition • Most popular source of environmental information • Free • Can reach a large captive audience • Can include graphics and video • Most people would rather watch than read 	<ul style="list-style-type: none"> • Working with reporters takes time and patience • Reporters might change focus of desired coverage • Training on giving interviews might be needed 	<ul style="list-style-type: none"> • Events • Weekly reports • Hot topics • Controversial issues • Public education
Advertising with TV or Radio PSAs	<ul style="list-style-type: none"> • Can be free to air • Can reach a large audience • Can focus in on target audience • Can provide follow-up through toll-free medium (hotline or Web site) • TV ads provide high impact and the ability to demonstrate a behavior 	<ul style="list-style-type: none"> • Stiff competition for air time • Very passive • Difficult to evaluate effectiveness • Can be expensive to produce TV PSAs of suitable quality • Short format often does not allow for more than awareness • Little control of time of airing without paying; sometimes aired late at night • Message can be obscured by commercial clutter • Target audience might not be watching/listening when advertisement is aired 	<ul style="list-style-type: none"> • Events • Fundraisers • Building awareness
Videos	<ul style="list-style-type: none"> • Can discuss an issue in depth • Have control over the content • Can be visually appealing • Can air on cable television stations 	<ul style="list-style-type: none"> • High costs • Hard to do well • Need a good distribution mechanism 	<ul style="list-style-type: none"> • Workshops • Public education • Schools
Printed formats such as newsletters and brochures	<ul style="list-style-type: none"> • Can reach a large audience • Can be more technical than other formats • Can tailor messages for specific audiences for different publications • Go beyond building awareness by providing detailed information • Reach more educated audiences • Audience can clip, reread, and think about the material • Might provide more credibility • Often low-cost (with unit prices decreasing with quantity) • Good to use as a follow-up mechanism 	<ul style="list-style-type: none"> • Printing and mailing are costly • Require staff time • Passive, not participatory • Only as good as the mailing list used or kiosks and help desks where placed • Audience must have the interest to pick them up and read them • Small ads might not be noticed 	<ul style="list-style-type: none"> • Articles and interviews • Events (announcing and summarizing) • Workshops • Scientific data • Requesting feedback from public • Public education

Choosing the Right Format (cont.)			
Format	Pros	Cons	Uses
Events	<ul style="list-style-type: none"> • Good for persuasion • Can model positive behavior • More personal • Offer two-way communication 	<ul style="list-style-type: none"> • Might be difficult to reach entire audience • Require staff time • Could be expensive • Potential low attendance • Require significant planning time • Require publicity for success • Can damage reputation if not done well 	<ul style="list-style-type: none"> • Awareness and recognition • One-on-one communication • Encouraging and modeling behavior change (motivating action)
Presentations - workshops - conferences - group meetings	<ul style="list-style-type: none"> • Can be participatory • Good for persuasion • Can model positive behavior • More personal 	<ul style="list-style-type: none"> • Reach small audiences • Require staff time • Can be too technical • Hard to get commitment to attend; need to offer incentives • Person delivering the presentation could make or break it 	<ul style="list-style-type: none"> • Getting feedback from attendees • Awareness and recognition • Public education
Giveaways	<ul style="list-style-type: none"> • Increase awareness • Inexpensive • Easy to produce 	<ul style="list-style-type: none"> • Very short message • Not very persuasive • Materials themselves might be considered "pollution" or "junk" 	<ul style="list-style-type: none"> • Awareness building • Distribution at events and workshops • Incentives for participation • Behavior reminders (prompts)
Web sites	<ul style="list-style-type: none"> • Can reach a large audience • Inexpensive • Easily maintained • Offer up-to-date information 	<ul style="list-style-type: none"> • A challenge to market • Difficult to evaluate effectiveness • A long-term project 	<ul style="list-style-type: none"> • Public education • Returning visitors if material is updated frequently
Internet Listservers	<ul style="list-style-type: none"> • Can reach a discrete audience • Inexpensive • Easily maintained 	<ul style="list-style-type: none"> • May be spreading the message to an already educated audience • Long-term project 	<ul style="list-style-type: none"> • Ongoing projects or complex campaigns • Public education
Displays - libraries - malls - fairs/ events	<ul style="list-style-type: none"> • Can reach a large audience • Visually pleasing • Reusable 	<ul style="list-style-type: none"> • Require staff time • Must be durable • Can be specific to an event, which can date the materials 	<ul style="list-style-type: none"> • Awareness and recognition
Billboards	<ul style="list-style-type: none"> • Can reach a large audience • Visually pleasing 	<ul style="list-style-type: none"> • Very short message • Drivers might not read billboards that require high amounts of attention • Generally high costs 	<ul style="list-style-type: none"> • Awareness and recognition • Behavior reminders (prompts)

Reporters often cover water quality issues debated at public meetings and other events. Expanding coverage through a planned, proactive approach can help build and support new attitudes, generate interest in remediation projects, promote possible solutions to water quality problems, introduce and explain policy or funding proposals, and motivate or reinforce volunteers in the field. Public agencies are discovering that working with the media helps in building awareness of agency activities, responding quickly to public concerns, explaining technical issues, and clarifying enforcement programs.

When using the media, or any other message distribution format, it's helpful to remember the standard formula for producing results in marketing campaigns: *Reach* \times *frequency* = *results*.

The number of people receiving your message (reach) multiplied by the number of times they receive it will determine the results of your effort. Hitting the target audience once with a great message just won't do the job. They have to hear it over and over again—just like preschoolers learning their ABCs. That's why you see the same ads broadcast time after time on TV and radio. After a while, the marketers know their message will break through the clutter and resonate with you, possibly motivating you to buy the product or vote for the candidate.

Delivering educational, promotional, or motivational messages through the news media is similar to distributing them through other mechanisms. If you want results, you need to repeat the message frequently and link it to something the audience values. Covering watershed issues from several different angles can help accomplish this. Orienting yourself to the workings of the media and the needs of reporters will help keep your program focused and effective.

Becoming a student of the media (rather than just a consumer) can help you discover important information about how a particular media outlet covers the news—things like who reports on environmental issues, what's been covered so far, and what topics are the subject of editorials. Developing some knowledge of a media outlet will help later, when you're discussing possible coverage for your events or issues.

What makes the news?

Certain key elements apply to what is covered as news. Good news stories have at least one of the following attributes:

- Involve local people or issues/documented statistics
- Focus on unique or unusual attributes
- Relate to significant issues or events
- Quote well-known or respected members of the community
- Affect many people throughout a region
- Involve controversial issues or strong emotions
- Include a celebrity figure
- Are timely

Your outreach or educational messages won't be required to have all these significant elements, but the more they have, the more likely they'll be covered by the media. This aspect of media involvement shouldn't be discouraging: a quick look at any newspaper or TV news broadcast provides a glimpse of how thin the thread of "significance" can be. The news is filled with information on research studies, government activities, business developments, societal trends and fads,

sporting events, and other sometimes less-than-weighty concerns. The involvement of a celebrity can provide a huge boost to your outreach effort by generating significant media interest. When Backstreet Boys singer Kevin Richardson created the Just Within Reach Foundation (www.justwithinreach.com) to push for greater environmental responsibility in his native Kentucky, media coverage of water quality and other issues skyrocketed. With a little thought and planning, you should have no problem placing your message in the news.

How do I “do” the news?

If you’ve considered what makes a message newsworthy, you’ll have no problems packaging your watershed outreach and educational information for reporters. The simple recipe is to identify the nugget of your message that contains the news (the elements noted in the previous section), and incorporate other information designed to educate, engage, or motivate the audience. The news nugget (think “headline”) will determine the likelihood and type of coverage, so it’s important to think about how it can best be presented to achieve the intended outreach objective without boring the audience. To educate or motivate, it’s necessary to attract and hold the attention of the target group. Watershed issues can be vibrant, complex, engaging, compelling, and incredibly interesting—much like the watersheds themselves. Reflect this in your messages.

How can you do this? First, think like a reporter: What would be interesting? It doesn’t have to be earth-shattering. Consider the following headlines, which summarize news nuggets you can build an article or broadcast feature around:

- Monitoring results show no gains in water quality
- Workshops improving sediment controls on building sites, group says
- Neighbors take a break from lakeside mowing, watch wildflowers bloom
- Health Department urging septic system inspections
- Mayor Smith to host stream restoration workshop at local restaurant

You get the idea. You’re doing a lot of interesting stuff. Make your news appealing to reporters so they can make it interesting to the target audience.

Keep in mind that our society is experiencing information overload, so it’s crucial that you get your information out in plain language, in easily digestible chunks, and in a form that will be used. Because of the immediacy of the Internet, many reporters and writers no longer have daily deadlines. Stories are often posted as soon as they’re written.





Get the reporters in your corner

In Utah, the Kids Organized to Protect Our Environment (KOPE) developed a personal rapport with local TV news reporters to gain coverage of their efforts to protect an urban stream from being converted to a shopping center parking lot. The reporters, who then became advocates on a personal level, turned out to cover city council meetings, cleanup days, and community festivals organized by the kids to protect the stream. According to Lynn Olsen, a parent volunteer for KOPE, “The reporters would write their stories in order to tell the children’s point of view.”



Check out the Getting In Step video.

Establishing a relationship with the media

After you’ve become oriented to the perspectives of the media and have packaged your outreach information accordingly, you’ll be ready to discuss coverage with reporters or news editors. Establishing a relationship with reporters and editorial staff is just as important as developing the news element of your message—perhaps even more important. This point cannot be overemphasized. In fact, it’s highly recommended that you introduce yourself to the news staff and start developing a relationship before you submit anything for coverage. Establishing a dialogue with reporters on what you’re trying to accomplish with your outreach program will help both of you determine how to meet each other’s needs.

After the reporting staff knows who you are and what you’re doing, they might call and ask you to respond to questions on other water quality news stories. If you don’t have anything to offer, ask them about their deadline and try to get the information to them before the deadline. You’re trying to establish and maintain a positive, helpful relationship with the news staff so both of you can better serve the public.

It’s important to realize that reporters are usually working under the pressure of a deadline and don’t like runarounds. They become agitated and suspicious if you are slow to release information, especially if it’s public information subject to the Freedom of Information Act. Also, remember that very few reporters are trained in the sciences. It will be your job to provide a rudimentary education on watershed science—why things like suspended solids, dissolved oxygen, phosphorus, bacteria, and riparian cover are important.

Developing a relationship with reporters and helping them to understand your issues will pay off in increased reporting, better media relations, and fewer factual distortions. Providing reporters with appropriate background information (no more than three or four pages unless asked) and identifying interview subjects also helps. Be proactive rather than reactive.

Levels of doing the news

At the most basic level, “doing the news” means providing a steady stream of interesting, educational, informative material related to a news nugget that appears in the first paragraph of the release. In a watershed outreach program, releases should support objectives identified by the planning and management team. They should be designed to educate, inform, engage, or motivate members of the target audience or to build general awareness, support, and interest. If an event is being planned, a news advisory can be issued to tell the media where, when, and why it’s occurring and who will be there.

If there is significant interest on the part of the media and their audience, you might consider proposing more in-depth coverage. Feature articles, interview programs, status/trends analyses, and news forums all provide an opportunity for informing and educating the public and policy makers on the sometimes complex array of issues and answers related to water quality problems. Be forewarned: These projects can involve a lot of research and a lot of work. Producing a biweekly column on water monitoring trends for Ten Mile Lake, for example, will entail a significant commitment to collect the data and meet printing deadlines. But the opportunity to reach thousands of people with this information might make such an endeavor worthwhile. People think about only what's in front of them. Water quality issues are for the most part public policy issues, and the more you can help the media explain these issues and review what needs to be done, the better the ultimate solutions are likely to be.

News coverage formats: News releases

News releases provide reporters with the basics they need to develop a news story. They can be written in a news style so that they can be used "as is," although good reporters will prefer to rewrite your story in their own words. News releases include the who, what, when, where, why, and how of your story. In large cities TV stations and newspapers receive many releases each day, so it's important to hit the high points without going on ad infinitum. One- or two-page news releases are standard. If a reporter chooses to expand your news release into a longer story, he or she will contact you for more information.

When reviewing news releases, reporters typically look for one primary element—a local connection. Releases that indicate reporters should "insert name of county here" are often tossed immediately. Mention a local person or the appropriate city, county, river, lake, or stream in the first paragraph to generate maximum interest.

News releases are an efficient way to alert the public about a wide variety of issues. Use them to announce public events, summarize water monitoring information, discuss policy development issues, provide perspectives on improving water quality, or encourage the adoption of appropriate management practices. "Think Blue," San Diego's stormwater pollution prevention outreach program, protects local beaches with TV and radio PSAs, brochures, fact sheets, and more. When the program won four Emmy awards for its TV PSA, it announced the win in a news release (see box on page 46). Note the mention of the local city, San Diego, in the first line of the release.



Check out the Getting In Step video.

Bringing the media to you



Taking reporters out on monitoring field trips in the summer might be the most beneficial thing a public agency or private organization can do to further the education of reporters—and, more important, their audiences—on water quality issues. The news business is typically slow in the summer, and reporters have time to spend in the field. Taking them out to collect macroinvertebrates, monitor lake water quality, conduct field surveys, sample dissolved oxygen and pH, or count bacteria colonies in the lab gives you an opportunity to get to know them on a more personal basis, without the pressure of phone tag, deadlines, or hot issues.

Reporters are naturally inquisitive people, but most know little about designated uses, use-based water quality criteria, types of criteria, TMDLs, best management practices, and the like. In the field, you can explain the role of your organization and provide a summary education to reporters on water quality issues of importance to your area. Later, when an important or controversial issue arises, the reporters will have a good idea of who you are and what you're doing and will likely call you to discuss the perspective of your group before releasing a story.

FOR IMMEDIATE RELEASE
Contact: Deborah Castillo, City of San Diego, (619) 525-8649,
DCastillo@sandiego.gov

“THINK BLUE” PSA TAKES HOME FOUR EMMY AWARDS

San Diego—June 17, 2002 - The City of San Diego’s Storm Water Pollution Prevention Program and American Dream Cinema were big winners at the 28th annual regional Emmy Awards Saturday, June 15. Nominated in six categories, the “Think Blue: Roads to Beaches” Public Service Announcement (PSA) dominated, winning in four of the six categories.

The awards were handed out by the Pacific Southwest Chapter of the National Academy of Television Arts and Sciences in a ceremony at the U.S. Grant Hotel. Taking home the Emmy were Greg Youtsey for Outstanding Achievement in Audio for a Spot, Jim Orr for Outstanding Achievement in Photography (Spot), and Ernie Anderson, Deborah Castillo, William Yancey and Jeanne Scott for Outstanding Achievement in Writing (Spot) and Outstanding Achievement for a Public Service Announcement.

The “Roads to Beaches” PSA was one of three produced by the City’s Storm Water Program in the first year of its media campaign. In addition to “Roads to Beaches,” the Storm Water Program produced two other PSAs with Four Square Productions, which was also nominated for its “Think Blue: Water Babies” PSA.

“This is a wonderful achievement for the City of San Diego and our program,” said Program Director Ernie Anderson. “It is not often that a government agency has the opportunity to do something like this and attain such wonderful recognition.”

The emphasis of the “Think Blue” campaign is to educate San Diego residents, businesses and industry about storm water pollution, which accounts for approximately 90% of all beach postings and closures in the City and threatens the quality of living that San Diego is known for.

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Be sure to send the news release in a timely manner. Releases sent too early might get lost on the reporter’s desk, and releases sent too late might not make it into the newspaper. If you’d like reporters to attend a coming event, send releases 5 days in advance. Other releases should be sent a few days before the newspaper’s deadline. Make a follow-up call to each reporter to confirm receipt of the release and respond to any questions.

How to write a news release

News releases are usually one page long, but they can be longer if the subject is sufficiently important. When writing a news release, start with the local connection and “news nugget”—the most important element—first. Then present supporting information, putting the least important material at the end. It’s important to grab the reporter’s attention in the first paragraph. Quotes from a spokesperson can be included, although many newspapers might want to confirm direct quotes prior to publication.

What makes the news? To increase the chances that your release will be used, keep in mind the elements reporters look for in a news story. Your release doesn’t need to have all the elements listed below, but the more of them you include, the better your chances for coverage:

- Involve local people or issues/documented statistics
- Focus on unique or unusual attributes
- Relate to significant issues or events
- Quote well-known or respected members of the community
- Affect many people throughout a region
- Involve controversial issues or strong emotions
- Include a celebrity figure
- Are timely

How to send the news release to the media outlet

The news media are a target audience just like any other audience. Get to know the reporters that cover the environmental beat ahead of time, and ask them how you should format your releases. Many now prefer e-mail but want the text pasted into the body of the e-mail message rather than included in attachments because of potential virus threats. Newspapers and TV news programs often want relevant graphics like photos or graphs of water monitoring trends. Ask reporters what type of format they prefer and how material should be delivered.

Here are some tips for writing news releases:

- Keep sentences short
- Avoid jargon
- Write in the active voice
- Keep paragraphs short
- Ask for peer editing
- Proofread, proofread, proofread!

News release nuts and bolts

- Include “For immediate release,” the date, and the name and phone number of the contact person at the top
- Use a catchy headline, touching on the news nugget
- Include short paragraphs telling who, what, where, when, why, and how
- Add “###” at the bottom center of the page to indicate the end of the document
- If the document has two pages, put “more” at the bottom of the first page rather than “###”



News coverage formats: video news releases

A video news release (VNR) is the TV equivalent of a written press release, and it is becoming an increasingly important piece of outreach campaigns. A video news release greatly increases your odds that TV news programs will cover your story. As you would for a written news release, you establish the story angle and control the content, but stations are free to embellish or otherwise change the story before they decide to run it. And just like a news release, the media may reject your story altogether. That's why it's important to ensure that your message is newsworthy, well presented, and well produced.

A VNR is a pre-produced (pre-taped, edited, and narrated) news item for TV. It is typically 1 to 3 minutes long, often with an additional 3 to 6 minutes of b-roll (raw footage). A VNR often includes interviews with experts who provide effective sound bites that bring out the core of your message, as well as supporting visuals. It usually opens with a background slate (a text screen that contains summary information such as the date, the name of your organization, the name of the project, and contact information) that stays on the screen for about 5 seconds. The VNR should be shot in a broadcast news style with quick cuts, steady shots, offset interviews, and the like. Here are some other tips for creating effective VNRs:

- Hire a professional production company to do the script-writing, shooting, and editing, unless you have access to staff members or partners who have such talents.
- Include a very brief, one-sentence summary of the story on the opening slate as the "Suggested Anchor Lead," which a local news anchor can read at the top of the story.
- Ask the experts interviewed for the VNR to look at the interviewer slightly off-camera to the right or left, not directly into the camera.
- Encourage the press to call the key interviewers or other experts directly to confirm the information they have received.
- Use graphics and animation to illustrate key points of technical or complex stories.
- Ask the production company to present all the names and titles of people interviewed in or speaking on the video (called "supers" or "chyrons") on a slate at the start of the VNR rather than on the tape during the VNR. This approach will allow a station to recreate this information in its own type style. Be sure the sequence of names on the slate matches the order of appearance in the VNR.
- Shoot, edit, and reproduce the VNR in a broadcast-quality format such as Betacam, DVC-Pro, or Mini-DV. Check with the station to find out which format(s) it uses.

The VNR is an effective way to get press coverage of a particularly newsworthy issue or event. With TV news budget cuts, there is an escalating demand for more pre-produced material. A well-produced VNR can often receive excellent pickup from local news stations.

The VNR is sent directly to local TV stations or can even be transmitted via satellite feeds to regional or national audiences. For local or regional campaigns, follow up by calling the stations on which you would like to see your VNR aired. VNRs are used by many stations because it saves them time and effort they would otherwise spend producing stories from scratch. Though more costly than a press release, a well-produced VNR can potentially propel your message into millions of homes. Many companies can provide this service or assist you in this effort.

The Minnesota Department of Natural Resources spends about \$80,000 annually to produce VNRs that reach more than 8 million viewers each year (a cost of about one cent per person—an extremely low delivery cost). Read more about Minnesota's VNRs at www.dnr.state.mn.us/new/vnr/faq.html.

News coverage formats: Letters to the editor

A letter to the editor is a good way to raise awareness of issues, concerns, or conditions that should be brought to the attention of the public. Individual citizens and organizations often write letters to the editor to clarify previously printed articles or to introduce a subject that someone believes should be discussed. When sending a letter to the editor, check out the newspaper's requirements. Most papers ask that letters be 250 words or less and reserve the right to edit your letter before publishing it. Include your contact information in case the paper would like to speak with you further. Many newspapers have a page on their Web sites where you can submit your letter online.

Tips for writing a letter to the editor

- Be brief, clear, and to the point
- Sign your name and note your affiliation
- Talk about the issues; don't get personal or petty
- Type your letter and limit it to the paper's length restriction (make it significantly shorter if possible)
- One letter per month per person is the limit for most papers
- Send your letter to a single paper; most papers require published letters to be exclusives



News coverage formats: Query letters

A query letter is sent to the editorial staff to determine potential interest in a story idea. Prior contact with the staff is recommended before you submit a story or even write it. Give the editor a chance to reject or redirect it before you expend any significant resources. Usually the query is made through a letter, but e-mails can be sent if the editor accepts them. Check each organization's Web site or call and ask the news desk for its preferred format. The inquiry should describe the general content of the proposed piece, state the title or working title, if there is one, and address why the issue is relevant to the community. The topic should be well researched, and the query letter should be no longer than one page.

News coverage formats: News conferences

If you have some breaking information or an event that's too important for a news release, a news conference might be appropriate. Don't call a news conference unless there's big news. Calling a conference to cover routine issues or to generate publicity is like "crying wolf" to the media and could hurt your turnout for more important news conferences.

News conferences are important events that require thoughtful planning. A good moderator—one who can control the event without stifling the reporters—is needed. Usually a news conference opens with the distribution of a news release that explains the reason for the conference and provides informative quotes from people involved in the issue, background information, and contact information. The moderator then makes a few welcoming/introductory remarks and introduces other speakers or makes a statement (which is often read). Remarks by all speakers should be carefully prepared. The floor is then opened for questions, which usually can be anticipated and prepared for beforehand. Spend a little time in the days or hours before the news conference generating a list of likely questions, so you'll be able to respond confidently and accurately.

Make sure you invite all news outlets in the area to your conference, and send a news release immediately afterward to those who didn't show up. News conferences can be held almost anywhere but are usually indoors with plenty of seating provided. Backdrops and other props are good elements for enhancing TV potential. Holding a news conference at the edge of a polluted stream, in front of a storm drain, or at another location that leaves a lasting impression will add interest to your news; however, you should arrange for a contingency location for bad weather. After the news conference (usually a half-hour), invite reporters to accompany members of your group on a prearranged tour, if appropriate, to provide additional insight on the issue.

Advertising

Advertising differs from news coverage in that you are in control of what is aired or printed. Videos are increasingly becoming popular formats to showcase projects or organizations. However, the most common form of advertising is the public service announcement. A PSA is an effective way to use TV or radio airtime to raise public awareness about an issue, inform the public about a coming event, or recruit volunteers. A PSA can be written or presented in audio or video format. Though PSAs cover less material than news releases, they include the same “who, what, where, when, why, and how.”

Advertising formats: The radio PSA

Even in this TV-focused world, radio remains a strong media contender because of its affordable production cost and creative possibilities. Radio is everywhere and nearly everyone hears it sometime, somewhere, every day. According to Arbitron, an international media and marketing research firm, radio reaches 96 percent of people over age 12 each week and 77 percent each day! Of course, those same universal qualities are what dilute its impact: it can become background noise. Your message must be repeated often to reach listeners at various times. Targeting specific audiences—young people, farmers, public radio listeners—is relatively easy to do in radio, given the specialized formats in most markets. To saturate whole markets, you’ll need to distribute your message to many stations. Get right to the central theme (the point you want to project) because you don’t have much time.

Getting the facts from the station. Radio stations play PSAs on free or purchased airtime. Purchasing airtime will increase the frequency at which your PSAs are played. Use the target audience demographics to help select the radio stations you want to broadcast your PSAs. Request a rate kit from all of the AM and FM radio stations in your geographic area. The average rate kit should contain statistical profiles of the age, gender, and consumer buying patterns of the station’s audience; a breakdown of listener activity by time; descriptions of network affiliates; sample advertising packages; and a rate card. The rate card is a cost guideline only; in broadcasting, nearly all prices are negotiable.

The station’s advertising sales representative will work with you to assemble a media schedule that fits your objectives and your pocketbook. Remember the reach and frequency factors. When working with a small budget, frequency is what matters most. That’s because you might need to run your ad several times a week to make your message sink in. If you spend your advertising budget reaching many people just a few times, your investment will be in vain. Instead of reaching 100 percent of the audience once, reach 10 percent of the audience 10 times. That’s the best way to get quality results on a limited budget.

To pay or not to pay

Although technically you can have your PSAs aired on TV at no cost (free airtime), you will not necessarily hit your target audience. By purchasing airtime, you can ensure that you’ll reach your audience and can often leverage additional coverage.

San Diego’s “Think Blue” program leveraged the airtime they purchased for their PSAs for more than \$250,000 with 32 local broadcasters to receive additional coverage for free. Local broadcasters contributed 774 free airings of the PSAs, 40 news story features, and other promos for an in-kind value in excess of \$160,000.



Watershed Radio

The Watershed Radio program, an environmental education project for the Chesapeake Bay watershed, produced a series of 1-minute radio PSAs that highlight different aspects of the watershed. Twelve radio stations spread out over the watershed broadcasted the Watershed Radio PSAs. One of the PSAs is used as an example in the box "How to write and format a PSA" on page 53. For more information, visit www.serc.si.edu/watershed/index.htm. Watershed Radio was created by the Smithsonian Environmental Research Center and the Sierra Club.

Sea & Shore Radio

In 2001 the Maine Coastal Program, the Maine Sea Grant College Program, and the Wells National Estuarine Research Reserve reached a wide audience with basic information about the Maine coast's environmental resources through a 1-minute radio series called the Sea & Shore Educational Radio Program. The series featured a range of coastal and marine environmental topics, including beach health, marine debris, and salt marshes. For more information about the series, contact Paul Dest, Maine Coastal Program, at dest@wellsnerrcec.lib.me.us.

Radio stations typically do not guarantee the frequency or times for playing PSAs during free airtime. Many people think that the Federal Communications Commission requires radio and TV stations to allocate a certain amount of time to public service. However, the National Association of Broadcasters says that broadcasters are under no obligation to grant time to any specific group. In recent years, the government deregulated the industry to reduce the amount of paperwork required for radio and TV stations, and it gave stations the ability to set their own standards for PSA usage on both free and paid airtime.

Local radio stations often have feature programs but don't cover news in depth. Public stations might devote more time to news, analytical, or educational programs, but they might not reach the target audience. Although the extremely short nature of spot news coverage on radio does not lend itself well to deep analysis and lengthy information delivery, radio can play a valuable role in building awareness and reinforcing other outreach efforts.

What does it cost? If you plan to produce a recorded PSA, first determine how you will produce the message itself. Because radio is not a visual medium, a radio PSA "must be even better and more creative than television, even though you will spend a lot more on TV production," notes Roger Vilsack, an award-winning producer with more than 25 years of experience. "Because you don't have visual images, you have to create them with words and sound effects." Hire talented persons comfortable with acting out their parts rather than simply reading aloud. Vilsack recommends budgeting from \$1,500 to \$10,000 for the radio production, depending on the number of actors, music, and sound effects. If you hire a director, writer, or actor, the cost could increase an additional \$2,500 to \$5,000.

Asking a college or public radio station to help produce your radio spots might pay off. College students are usually interested in watershed issues and are often looking for projects that can be listed on resumes for consideration by prospective employers. Your campaign can help students develop experience and professional skills while raising awareness and support for watershed issues.

Tools of the trade. Once you've determined how you will produce the radio PSA, find out which format you need to use for submission. In the past radio stations accepted cassette or reel-to-reel tapes. Now the preferred format is CD-ROM. The production company will provide a music disc with the PSA track included for you to distribute. If you produce multiple PSAs or one PSA in multiple languages, include them all on the same CD-ROM to save time and money.

Remember to label your CD-ROM and its case with the PSA's title and length, and your contact information. Some types of CD-ROM packages are DiskPac (lightweight plastic case with a four-color printer cover that is glued to the plastic shell), wallet style (wallet-sized pocket

How to write and format a radio PSA

1. Use paper with the organization's letterhead.
2. Type "Public Service Announcement" at the top middle of the page.
3. Skip a few spaces.
4. Type the requested air date.
5. Insert the organization's contact name, phone number, fax number, e-mail address, and PSA length.
6. Skip a few lines.
7. Insert the PSA's title in bold letters.
8. The script should provide a brief description of the event/issue, including the who, what, when, where, why, and how.
9. The script should close with the name of your organization and where to go for more information.
10. Close the document with "###" at the bottom middle of the page.

Example:

PUBLIC SERVICE ANNOUNCEMENT

Requested Air Date: February 15, 2002

Watershed Radio
Smithsonian Environmental Research Center
Janis Oppelt
Phone: (301) 474-5358
Fax: (301) 261-3415 E-mail: janiso@erols.com
PSA Length: 60 seconds

From the Blue Ridge to the Bay, it's Watershed...

(music)

Nutrients, like phosphorus and nitrogen, from urban and agricultural areas are polluting the Chesapeake Bay. This is called nonpoint source pollution because it cannot be traced back to one particular source. Scientists, like those at the Smithsonian Environmental Research Center, measure nutrient levels in bay tributaries and, with the help of aerial photographs and many hours in the field, relate those nutrient levels to information about land use, especially in areas close to streams. The work is very labor-intensive, but the better we understand the source of the pollution, the more we can do to clean up the bay.

Watershed Radio is produced by the Sierra Club and the Smithsonian Environmental Research Center. For more information, visit watershedradio.org.

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Going online?

With the increased household use of the Internet, many outreach campaigns are relying more on placing PSAs online. Leading market research firms believe that before this decade ends Americans will get most of their information from the Internet and other interactive technologies. Although only 21 percent, or about 40 million American adults, were connected to the Internet in 1995 (National Science Foundation, www.nsf.gov/sbe/srs/seind00/frames.htm), today more than 167 million adults regularly log on at home or at work (Jim Nail, "Online Advertising Eclipsed," Forester Research, 2001). The Ad Council recently reported approximately \$391 million in donated advertising space generated from online placements alone—an increase of 500 percent from the year before. The difficulty with online placement is finding out what sites your target audience visits. If your ads are aimed at children, it would be appropriate to post ads on Yahoo!igans (www.yahoo!igans.com), the Yahoo! page dedicated to kids.

folder printed on heavy-duty card stock), and script booklet style (an 8½-inch by 11-inch folder that can include a script booklet, CD-ROM, and evaluation reply card).

Script booklets can help radio stations learn more about your topic and your organization. They can include the recorded PSA script, additional live announcer scripts, and contact information. The Make-A-Wish Foundation, for example, used a script booklet to provide additional media information for the radio stations and a list of its local office locations.

To minimize production costs, prepare and send in scripts for live radio. Typed and double-spaced copy is required for community calendars and other public notice programs. Tying your release to a special day or event (such as Earth Day) and updating it with different angles later will make it more attractive. Take time to ensure scripts are written for the ear, and support your submissions with follow-up calls or letters, or even promotional items like posters. Remember that airtime for PSAs is available for free, but sometimes the time slots are late at night or very early in the morning. Avoid basing a significant part of an outreach campaign on free radio PSAs unless you are sure that this is the best way to reach the target audience. If possible, purchase airtime for your PSA to expand its reach.

Find a good radio voice to deliver your message (if the radio announcer is not the reader). You'll know such a voice when you hear it: it's full, rich, and resonant with good intonation and pronunciation. The pace must be comfortable and natural, not racing or languid. The voice embodies the message, so consider the relative merits of a man's voice or a woman's, a young voice or one more mature, the smooth professional sound or the homey conversational tone. As always, consider the target audience. Pay similar attention to other sounds that will be used because in radio sound provides the picture. Sound effects and background music are now available on compact disc or the Internet. Make sure it's legal to use the sounds or music you're considering. When in doubt, leave it out.

Advertising formats: The TV PSA

According to Nielsen Media Research's *2000 Report on Television*, Americans watch an average of more than 4 hours of TV a day, or 2 months of TV a year. Television is picture-oriented and action-driven. TV news, according to an industry publication, is always about people. In addition, TV stations search for stories that have emotion, controversy, conflict, and great video and are engaging and compelling. According to a 1997 survey of public affairs directors by the National CASA Association, 47 percent of television PSAs were affiliated with nonprofit organizations. In addition, public affairs directors were more likely to consider children's issues than any other cause.

TV PSAs are a very effective method for educating the public. The TV PSA format varies from a short announcement on the local news to a professional video resembling a commercial, depending on the organization's priorities and budget. TV stations put PSAs at the bottom of the advertising ladder (paid commercials get first choice, followed by station promotions), but they do air PSAs as a public service with free airtime. Look for PSAs currently on the air, and develop your PSA in a similar manner. TV PSAs last 30 seconds or less, similar to the length of a commercial. Short PSAs of 30 seconds are more likely to be aired.

TV production can be expensive and requires experienced technicians and costly camera equipment. For example, the organizers of RiverSmart, a new national campaign to encourage people to make simple changes in their everyday activities to help protect rivers, created three creative, professional TV PSAs at a total cost of \$30,000. With today's digital technology and software capabilities, however, video production doesn't have to be cost-prohibitive. If you know someone who's good at shooting video, ask that person to volunteer to help. In addition, journalism students at local colleges and universities might be willing to help out. Talk to some professors about setting up a class project focused on your effort. Also consider the use of local public access cable, a format growing in popularity because organizations can broadcast messages without station oversight. public access cable studios and their technicians might provide an additional resource option for developing your PSA.

If you're using TV PSAs, keep in mind that TV stations receive many PSAs from a wide variety of organizations every day. To increase the chances of having yours aired, keep your copy simple and to the point, highlighting the essentials. You should approach stations about 6 weeks before the PSA would run. Most stations accept videos on 1-inch, $\frac{3}{4}$ -inch, and Beta tape, though Beta is preferred. DVC-Pro, DV-Cam, and mini DV are digital tape formats that are growing in popularity.

A face is worth a thousand words, and a famous face...

When possible, use local or national celebrities in your PSA. Many organizations have used celebrities or elected officials to relay their messages. In 1999 the Louisiana Department of Natural Resources released broadcast PSAs for the "Save Louisiana Wetlands" campaign starring performers Harry Connick, Jr., and Aaron Neville, Chef Paul Prudhomme, and Kermit the Frog (www.savelawetlands.org/site/psa.html).

To gain public interest in stream protection and storm drain stenciling, the City of Honolulu developed PSAs featuring celebrities like Richard Chamberlain, the late John Denver, Jackie Chan, David Copperfield, Hawaiian star Jason Scott Lee, and local comedian Frank De Lima. All of the celebrities generously donated their time. Honolulu's prime time slots were made possible through an agreement with TV stations to air one free prime time message for every paid prime time message (www.cleanwaterhonolulu.com).

PSA Fast Facts

In 2002 West Glen Communications, Inc., a broadcast services company, conducted a survey of public service directors at 157 TV stations and 127 radio stations in its 2002 Television and Radio Survey. The survey provides a snapshot of what TV and radio stations are looking for in PSAs. The complete survey results are available at www.westglen.com/pr_news.

	TV	Radio
Percentage aired	31 percent	35 percent
Time of day aired	45 percent overnight 55 percent other	all day and night
Average length of rotation time	3 to 6 months	1 to 3 months
Preferred length	(1) 30 seconds (2) 60 seconds (3) 15 seconds	
Preferred formats	Beta SP or Beta	CD or live copy
Air community calendar information	78 percent	95 percent
Types of nonprofits qualifying for free air time (Stations were asked to check all that applied; therefore, responses will not tally to 100 percent.)	100 percent charitable 73 percent civic 64 percent social/recreation 44 percent labor 40 percent trade	100 percent charitable 89 percent civic 78 percent social/recreation 56 percent labor 54 percent trade

Top 4 Reasons PSAs Are Not Aired

- | | |
|----------------------------------|---|
| 1. Content not relevant | 3. Dated materials received late |
| 2. Content too commercial | 4. Poor production quality |

Environmental PSAs might feature various landscapes or citizens in action as a background with a narrator emphasizing the highlights. Organizers of Maine's Nonpoint Source Awareness Campaign, a collaborative effort between the Maine Department of Environmental Protection and the State Planning Office, developed a 30-minute TV show and seven PSAs. The PSAs showed various scenes, including a dripping pipe, a fly-over view of a meandering stream, water flowing over rocks, and their logo and contact information. Maine PBS journalist Patsy Wiggins provided the narration. Visit the campaign's Web site for more information: www.state.me.us/dep/blwq/docwatershed/npscamp.htm.

Videos

Videos can be produced to visually showcase your project or issue. To generate interest in a cause, it's often better to show people what the problems and solutions are than to expect people to read about them. People are, by nature, picture-driven. That said, producing a video is very resource intensive, in terms of both time and money. Getting it right takes a lot of experience. Think back on some of the home videos you've watched.

The cost of producing a video can vary widely depending on a variety of factors such as script writing, use of hired talent, production facili-



Maine DEP's Watershed TV PSA

Script: Patsy, voice-over, :30


Polluted runoff... A lot of it starts with you and me... From the things we do every day.

We all live in a watershed. A watershed is the land area... like a bowl... across which water flows downstream to our lakes, streams, or oceans.

Because we all live downstream, everything we do, from fertilizing our lawns to spilling motor oil, contributes to water pollution.

Call today for tips on protecting our lakes, streams, and coastal waters... because clean water starts with you.

ties, and location. If you are interested in producing a video, check first with your local public cable access station. You might be able to get the production time and equipment use for free. The cable access station that helps produce your video will typically require you to air it on that station, but that's just free distribution for you.

The Annis Water Resources Institute of Grand Valley State University in west Michigan produced a video on its Bear Creek water quality project to share lessons learned with other interested watershed organizations. The cost of producing the 28-minute video was roughly \$3,500. The Institute paid for a script writer, two actors, and the materials. They received many hours of free labor, and this cost did not include staff time. The Institute also had experienced videographers on staff. Without donated labor or resources, expect to pay \$1,000 to \$3,000 per minute of finished video. Thus, a 10-minute video could cost from \$10,000 to \$30,000.  *Check out the [Getting In Step](#) video.*

Keep in mind that cable access stations are different from public television stations. Public television stations have specific requirements for the length of the video and quality of the tape. It must be broadcast quality. The costs are also higher because public television stations rent out their facilities and equipment.

Calendars

Calendars are a terrific outreach tool. They can be colorful, the messages on each page stay in front of the audience for a month at a time, and everyone uses them. Some groups custom-tailor their calendars and turn them into activity logs. People can keep track of the year's observable water events: ice-out and freeze-up, waterfowl migrations and nestings, mammal sightings, insect hatchings, and the like. You must plan carefully for distribution to hit the market around November when people are shopping for next year's calendar.

Other printed format options

- Newspaper insert
- Water bill insert
- Discount card or coupon
- Children's coloring book
- Restaurant placemats
- Curriculum
- Maps

Print materials

By far the most popular format for outreach campaigns is print. Printed materials include items like fact sheets, brochures, flyers, booklets, posters, bus placards, billboards, and doorknob hangers. The list goes on. These materials can be created easily and the target audience can refer to them again and again. When preparing printed material, be aware of how the target audience will use the information. If it is to be faxed or photocopied, you'll want to use a standard paper size and limit any artwork to line drawings. Dark-colored backgrounds can seriously limit photocopying, as you've probably discovered. Keep in mind that your message will compete with a lot of other printed material. Costs for high-quality color materials can be considerable, and the information can become dated quickly. Don't forget these issues during the planning phase. Check back to pages 40 and 41 to review the pros and cons of various formats.

Design and production

When designing the layout of your brochure, flyer, or how-to guide, use restraint, consistency, and quality materials. Restraint should be used in choosing typefaces or fonts; the kinds of graphics or artwork selected should be consistent; and quality materials should be used for photographs and artwork. Invite readers into your material with appealing, user-friendly layouts.

White space

White space is the space on the page that is left blank. White space should be treated as a graphic element and used liberally because it is very effective at drawing attention. Remember Nike's "Just Do It" ad campaign? Lots of white space, with the Nike logo and that short, simple phrase. People all over the world instantly know the brand name and its products.

To create white space immediately, try expanding the margins on your brochure or flyer. Make your headline wrap onto several lines so white space is created on the right side of the page. Don't full-justify your text. Ragged-right creates more white space at the end of each line. It also makes text easier to read because your brain remembers the last word in the ragged line above the one you're reading.

Typefaces

Design your materials so the layout draws the eye into and around the entire work. Select typefaces for readability. Provide variety, but don't go overboard. A good typeface calls attention to the message, not to itself. Choose no more than two or three different typefaces for your piece. **DO NOT USE ALL CAPS BECAUSE IT'S TOO HARD TO READ THE TEXT AND IT PUTS OFF READERS WHO FEEL LIKE THEY'RE BEING SHOUTED AT.** Sans serif fonts (fonts that don't have "feet" on the letters) are a good choice for headlines and subheads. Arial and

Helvetica are popular sans serif fonts. Serif fonts like Times Roman should be used for large blocks of text because your eye can read the words more easily. (This guide uses Frutiger typeface for the headers and ITC Slimbach for the text, which are similar to Arial and Times Roman, respectively.) Hundreds of fonts are available, but resist the urge to use them all in one publication. Experiment with fonts to get the look you want.

Layout of text

Always remember that the ultimate purpose of your materials is to communicate, so make your text readable. Don't organize text into a clever shape (like a circle or a Christmas tree) if it will be difficult to read. Be careful about using graphic images behind the text (watermarks) because they can make the text nearly unreadable if not done skillfully. A general rule of thumb is that the narrower the column of text, the smaller the font size. For example, on 8½- by 11-inch paper, if the text is 6 inches wide, the font size should be 12 point. If you choose a 2-column format, the font size may be decreased to 10 point, depending on the font. Most desktop publishing software packages include templates for various publication layouts.

Making your text come alive

Make the text interesting to your readers. Keep the length to a minimum and use the active voice. You can use various formats to make your text more engaging. Consider telling a story or leading off with a letter from a concerned citizen. Always try to include a local angle, and keep your message simple.

Hooks

Hooks are devices that can be used to reinforce information in the text or to grab the reader initially. Your headline can be a significant hook to engage the reader. Headers in the form of a question are always engaging. For example, a booklet on groundwater contamination could lead off with "Is someone contaminating your drinking water?" Consider including a light-hearted quiz at the end of your text to test the reader's knowledge. Using games, humor, or contests can also encourage the reader to read all of the material.

Logos

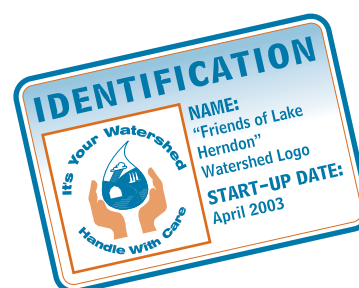
A logo is a visually distinctive treatment of your campaign or organization. It is the distilled, visual essence of who your organization is or what your campaign is trying to do. Think of your logo as your group or campaign's graphic signature. Plan for it to appear on all of your materials, including letterhead, business cards, brochures, newsletters, and meeting announcements. However, don't try to convey the objectives of your whole program in one logo. Instead, create a tag line or slogan to accompany your logo to make your message clearer.

Keeping costs down



The cost of printing outreach materials varies depending on several factors, such as number of colors used, size and type of paper, and number to be printed. To keep costs down, try the following:

- Always get three quotes for a printing job. You'll be surprised at the price differences. Be sure you're comparing "apples to apples."
- Allow plenty of time for production so you won't have to pay a rush charge.
- Check for "free color" days. Some printers print certain colors on certain days with no extra setup charges. Be sure to ask first.
- Ask for cheaper paper options. Sometimes printers have an overstock of certain kinds of paper because of job cancellations, prior sale purchases, and so forth.
- Think big. When deciding how many materials you want to print, remember your long-term needs. Printing charges per item diminish considerably after the first 1,000.





Tips for using clip art and photographs

- Keep all clip art files in a central folder so you can locate them easily
- Leave white space around the artwork; avoid crowding text
- Be sure to obtain permission from clip art Web site owners if required
- Select graphics that print well in both black-and-white and color
- Consider using a digital camera for ease of enhancing the image later and for use in electronic layouts, preferred by most printers. (Remember to use the highest-resolution setting on the camera to ensure print-quality photos.)
- Keep the sun at your back to bring out the most color and detail
- Look for backgrounds that suggest movement
- Dawn and dusk create soft, rosy, interesting light effects
- Midday lighting produces flat, shadowless images
- Take lots of pictures and screen them later
- People are interested in people, so use human subjects frequently
- Shoot people up close to avoid tiny, unrecognizable faces
- Kids and animals are almost always good subjects for photos

The key to a good logo is simplicity—clean, uncluttered lines and shapes. Ideally, people will recognize your materials from the logo alone. Silhouettes of objects often work well as logos. You might be able to start with a stock image or artwork, which will reduce your logo design costs. Creating custom artwork from scratch will increase the cost of your logo design substantially. Keep in mind that a logo must look good no matter how large or small it appears. You might be using it on large posters as well as business cards. Choose an image that’s aesthetically pleasing—something you’ll be proud to be identified with and glad to see again and again.

Using artwork and photos

Graphics—photos, logos, artwork, or even well-designed subheads—are great for breaking up long, gray blocks of text, giving readers a visual break. Images of lakes, streams, rivers, wetlands, and other watershed features are naturals for dressing up your message format. The emotional appeal they elicit can be tremendous. This section presents ideas for incorporating artwork and photos into your watershed message material and presentations.

Incorporating clip art. Clip art refers to drawings or other graphics used in outreach materials. Before clip art made the leap to computers, it was clipped from a booklet for use. Now you can use electronic images to suit your needs. You’ve most likely seen many examples in newspaper ads, in brochures, and even on Web sites. Clip art is produced specifically for the purpose of repeated use. It’s easily accessible and most is not copyrighted.

The quickest place to find clip art is on your computer. Most word processing and Web development programs already supply many free graphics for your use. If those aren’t appropriate, go online. There are hundreds of free clip art sites.

When you find an online image that meets your needs, simply right-click on the image and click on “save as.” Once you’ve saved the graphic, insert the art into your document by clicking on “insert,” “graphics,” “from file.” At all sites, be sure to read the webmaster’s rights of use. Some sites require citations or references to their sites in return for using their graphic. If you’re uncertain about the terms for use of a particular graphic or you can’t agree with the terms, you should not use the graphic.

Using photos effectively. Using photographs can reinforce your message dramatically, but it’s better not to use a photograph at all if it’s of poor quality. Taking effective photographs takes practice and patience. Photos of people, especially children, appeal to many audiences. Show action, such as water quality sampling, tree planting, or festival events, in your photographs. If you borrow photographs, the photographer might require a photo credit.

If you don't have access to a good photographer, consider using stock photos. These photos are available on CD-ROMs and can start as low as \$25 for a set of 50 good-quality photographs. The Internet also stocks thousands of images that can be downloaded. Make sure the resolution of your photos is appropriate for the format used. Print-quality digital files need high-resolution images to avoid a "pixelated" look. Lower resolution might be okay for Web-based formats. If you use a digital camera, you have a perfect opportunity to take photos of exactly what you need. Use the highest resolution possible, and save the photos as ".tif" (rather than ".jpg") images. This setting ensures the best reproduction and editing capabilities. The higher resolution will help you easily fine tune and edit the photo's shape and color and allow you to display the image in various sizes.

Brochures

Brochures are an effective way to present and explain your watershed message. Unlike many other communication vehicles, brochures can be distributed in many places. Racks can be set up at libraries, marinas, and fairs. You can pass out brochures at meetings. You can even organize a direct mail campaign. Think through the purpose of your brochure and its intended audience before you begin. You might use the brochure as a way to solicit interest and involvement, or to promote watershed education and positive behaviors. Its purpose will significantly influence its appearance and content.

Clip art on the Web

Here are a few popular clip art Web sites on the Internet:

- www.barrysclipart.com
- www.graphics.com
- www.clip-art.com
- www.clipartconnection.com
- www.free-clip-art.com

Tips for better brochures

- Use colored or textured paper, graphics, and an audience-targeted layout
- Explore various sizes and folds, taking care to fit the layout to the fold
- Collect and review samples to get an idea of what you like and don't like
- Produce enough extras on the first run to handle additional demand
- Using colored ink can result in interesting combinations
- Leave plenty of white space; don't crowd the content
- Include variety in design, but watch out for an overly "busy" appearance
- Use subheadings to break up massive blocks of text
- Use bullets for quick and easy reading
- Ask several people to edit, critique, and proofread
- Avoid acronyms and technical jargon; call nonpoint source pollution "polluted runoff"
- Don't forget to include an address and contact number for more information



Tips for better posters



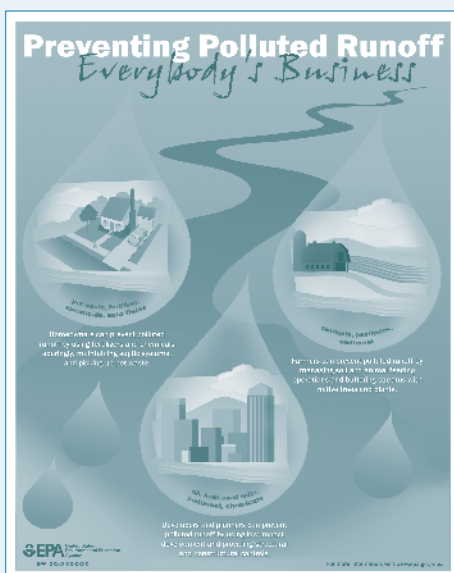
- Focus on the objective, target audience, and message
- Sponsor a photo or design contest to obtain original artwork
- Use a catchy slogan or theme
- Choose graphic elements that immediately convey the message
- Make sure the desired size is economical and tube-friendly
- Use large, bold graphics (photos, artwork, etc.) to command attention
- Use a standard size so it's easy to obtain a frame for the poster
- Think about how the viewer's eye will flow across the poster and take in the message
- Consider balance, contrast, and other aspects of good design

Flyers

Flyers can be extremely effective if they're engaging, concise, and memorable. They're often used to impart brief, important messages or implore people to take simple actions. Explore your options regarding paper and ink colors, typefaces, and type sizes. Keep the text brief, the letters fairly large, and the design attractive. If your production involves manual cut-and-paste, incorporate artwork or pictures by photocopying or by attaching them with spray glue or double-sided tape. Don't forget to consider the target audience in the design, composition, and distribution.

Posters

Posters, displayed for months or even years, can be an excellent option for message delivery. Text, photos, slogans—even graphs—can be presented effectively on posters. Mostly, however, posters are used to build awareness (“Save the Bay”) or deliver a simple message (“If you're not recycling, you're throwing it all away.”). Most posters are produced in full color; however, even less expensive black-and-white or one- or two-color posters can be compelling if designed well. Be aware: Production and distribution costs can be considerable. Mailing tubes and postage can cost even more than the poster itself. Folding and mailing in large envelopes causes creases that detract from appearance, but this does not necessarily mean abandoning the approach. Posters can pay for themselves through sales, but the poster design must be exceptional.



NPS outreach materials available

As part of the Year of Clean Water activities, EPA celebrated Nonpoint Source Pollution Awareness Month in March 2003. Several outreach materials were developed, including a poster (shown here), a bookmark, a pop-up sponge, two fact sheets, and a brochure. Adobe Acrobat files of these documents are available for download at www.epa.gov/nps/outreach.html.

Displays

When composing any large-format display, treat the entire display space as if it were a page layout, a photograph, or a painting. The same basic elements of composition that govern good design and flow apply. You might consider producing an informative companion piece, such as an illustrated fact sheet or simple brochure, to accompany the display.

Watershed project displays at conferences, seminars, or outdoor events provide an excellent venue for sharing information, educating and involving citizens, promoting helpful actions, creating linkages, and building general awareness. You need to compose a display so it's as aesthetically appealing as a well-designed page. Use an engaging, flowing design that attracts attention, invites the viewer in, and leads the eye throughout. For example, if your display highlights your volunteer monitoring program, use a dipnet as the backdrop and include various sampling instruments in the display. Experiment with different fabrics to drape over the backdrop of your display to add texture. Whenever possible, “show” your program instead of “telling” it.

Avoid the common pitfall of pasting up dozens of 8- by 10-inch photographs with tiny captions. Try blowing up a significant photograph to poster size and then use additional photographs to support the primary theme. Produce and distribute brochures or flyers to convey the details of your project. Again, focus on the objective—why you're at the event, what message you hope to deliver to which audience, and what you want to accomplish.

Billboards

Billboards, like posters, can effectively present an outreach message or raise awareness if they are well designed and attractive. Remember to link the billboard location to the target audience. For example, if your message is targeting boaters in coastal areas, your billboard location should be within a few miles of the coast. Outdoor advertising venues can expose tens of thousands of people to your message, but be sensitive to the fact that some people find billboards objectionable, especially on scenic rural roads. Billboards offer a chance to present highly compelling, noncommercial messages that can be engaging, artistic, and memorable. Other positive aspects of using a billboard include high reach (number of people), immediacy, and high frequency (number of times seen). A downside is that you can convey only a short message to a relatively nonspecified audience. In addition, it's difficult to evaluate the effectiveness of the message. Costs can also be considerable and are based on how many you buy, how long they are up, and where they are located. If you're considering using billboards, keep in mind that they are more effective at generating awareness or reminding people to do something than they are at educating, because people view them only briefly.



Tips for better displays

- **Make sure you can read the text from a comfortable distance**
- **Interactive displays are ideal; doing is always better than just seeing or reading**
- **Interest kids with something fun, and their parents will follow**
- **Refrain from using your exhibit as a literature dump or that's where it will end up**
- **Be creative with design and layout, and do things on a big scale**
- **Use fabric and materials to make the display 3-dimensional**

Billboards in action



The Texas Commission on Environmental Quality (TCEQ; formerly, the Texas Natural Resource Conservation Commission) launched a nonpoint source outreach campaign in 2001 that targeted watersheds with water quality problems where the causes were known. In watersheds where pet waste was identified as contributing to these problems, TCEQ developed a full-color billboard display of a dog

with the message, “Please pick up my poop.” The billboards served as a prompt to encourage behavior change. For more information, visit www.tnrc.state.tx.us/exec/sbea/nps/nps.html.

Presentations

If you’ve spent any time at conferences and meetings, chances are you’ve seen a few slides or overheads. Firing up a 60-slide PowerPoint show or dropping slides into a projector and setting up a screen does not, however, guarantee a successful show. It takes planning and practice to present your story as a beautifully wrapped package that creates a coherent and aesthetically pleasing visual journey. Go through the presentation several times out loud. Get comfortable with it, but don’t memorize it. Avoid saying “ah” or “um.” Practice using pauses instead.

Gear your presentation—its content and its style—to the audience. Once you have a stock of photos and slides to choose from, it’s simple to go back in and add, switch, or delete slides as appropriate. Avoid reading text slides during a presentation. Use the time to talk about the subject matter in the text. Focus your slide configuration and vocal presentation on telling a story based on your knowledge, experience, insight, and perspective. It’s a good idea to create an outline to make sure that your presentation has a central focus and a beginning, middle, and end. Self-directed humor is often effective if used sparingly. Make handouts of the slides if you can so the audience has something to refer to and to make notes.

Use only visually pleasing, in-focus photos and graphics. Avoid slides that require introductory apologies (e.g., “I know this is hard to see, but . . .”). Flow charts are notoriously indecipherable from a distance. Break down the chart items to several slides, or summarize the process being depicted in a larger format. Monitoring data charts can look busy or crowded unless carefully thought out in advance. Often, slides of water quality data are more meaningful and powerful if the

Tips for better billboards



- The message should change every 60 days or it will blend into the background
- Investigate display opportunities before designing or producing the ad
- Obtain at least three production/printing/display estimates
- Approach local businesses to request free display for public service ads
- Design a strong, simple ad that can be understood quickly at a distance
- Minimize the text and let the visuals make your point as much as possible



PowerPoint pointers

Like it or not, PowerPoint is the preferred medium for slide presentations. Avoid these pitfalls:

- **Color choices.** In general, if you are showing your slides in a very dark room, a dark background like black or royal blue with light text is best. If the room has some ambient light, a light background with black text is best.
- **Color scheme.** PowerPoint has a variety of templates and color schemes that help to make a unified presentation. Do not introduce more than three colors, and keep the background color the same throughout.
- **Sound effects.** Attaching sound effects to your text as it flies onto the screen can be amusing for the first few slides, but it will grow annoying. Use sound effects sparingly to emphasize key points.
- **Monotony busters.** Break up the text slides with full-color photographs or cartoons to avoid the appearance of the same slide being repeated.
- **Animation.** Introduce some movement to your slides through arrows appearing to highlight a key bullet, or graphics “dissolving” on the screen.
- **Text movement.** If your text flies onto the screen from the left, keep it consistent to avoid making the audience queasy.
- **Keep it moving.** Introduce your text in groups, or the whole slide at once, instead of line by line.
- **Bells and whistles.** Keep the special effects to a minimum so your listeners will be more interested in the content of your presentation.

data are summarized or distilled to an essential point. Keep in mind that the audience has only about 30 seconds per slide to digest the information. Always make sure text slides are readable, even from the back of the room. Don't be afraid to explore different choices of background themes and color schemes, but once you determine your choice, maintain it consistently throughout the presentation. Using default color schemes in presentation software will ensure appropriate contrast between background colors and text colors. Finally, consider using a rapid-fire photo montage at some point in the program: Present a succession of photos with little or no commentary, reinforcing your message with visual images that create a memorable impression.

When using overhead transparencies, remember to print your text in at least a 14-point font so it will be readable on the screen. In general, dark text against a light or clear background works best with transparencies. If using overheads, try to intersperse some nontext materials (such as a newspaper clipping or cartoon) to break up the presentation.

Events

A watershed event can be the most energizing format for distributing messages targeted at awareness, education, or direct action. A community event plays into audience members' desires for belonging to a group and having shared goals and visions for the community. They can also help to create new social norms that become incentives

for others to take part in the behaviors you're promoting. In urban areas, where knowing your neighbors and other members of your community is the exception instead of the rule, community events can help to strengthen the fabric of the community by creating and enhancing community relationships, building trust, and improving the relationships between government agencies and the public. And frankly, if done well, they're just plain fun.

If resources are limited and the message is fairly focused, try to piggyback onto an existing event that involves the target audience. Trade shows and other events for farmers, developers, boaters, fishers, the automobile industry, and other groups can often be accessed with a little research and a few phone calls. If you're hosting your own event, nothing can substitute for planning. No detail is too small, and no aspect is too insignificant to be thoroughly examined, reexamined, and subjected to contingency planning. Major events are much like military campaigns. You'll need plenty of advance time, information on the site, logistical plans, contingency plans (e.g., rain dates), a workforce commensurate with the objective, and the capacity to accommodate plenty of action.

A major consideration in planning an event is how you intend to attract attention. As in all outreach, you can't deliver a message to the target audience if you don't have access to them. Approaches for generating interest and attention are limited only by your creativity. Watershed groups have used blues bands, balloons, face-painting, mascots, dunking contests, interactive displays, video games, giveaways, clowns, jugglers, and celebrities to draw in crowds. Nearly any idea that works and does not detract from the message is acceptable. Increase the exposure of your event by inviting local TV and radio stations to cover it.

Community fairs and festivals

Festivals and fairs provide great opportunities for hands-on learning and can be fun for all ages. These types of events get people involved in different activities that show them that converting their behaviors to sustainable ones is easier than they thought. When people are actively and publicly involved at an event, they're more likely to commit to engaging in an activity at home. In addition, getting people to commit to a small, upbeat activity at a community fair increases the likelihood that they'll agree to commit to a subsequent, more demanding activity, such as organizing a stream cleanup.

Some things to consider when organizing a fair or festival:

- **Time and date.** Choose an appropriate time of year based on your geographic location and climate, particularly if your event will be held outside. Schedule a rain date, if appropriate.
- **Size of the event.** Decide on the number of attendees (as a range or target) you hope to have at your event.



Festival resources

The Groundwater Foundation's watershed festival series provides lots of tips for putting on a community or school festival:

- *Making Waves: How to Put on a Water Festival*
- *Making Ripples: How to Organize a School Water Festival*
- *Making More Waves: Ideas for Organizing Your Festival*
- *Making A Bigger Splash: Best Ever Water Festival Ideas*

Order them online at
www.groundwater.org.

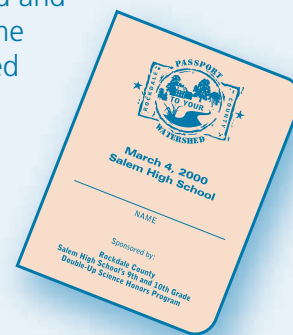
- **Facility/location.** If you need to reserve a banquet hall, community club site, or fairgrounds, be sure to check availability far in advance. Make sure the venue fits the message and the audience.
- **Types of activities.** Think about the types of activities you'd like to have at your fair or festival. Will there be games geared toward children? Will there be more complex concepts geared toward adults? Do you want attendees to visit each activity in a specific order or at their leisure? Choose activities that will help meet the objectives of your water quality improvement project. Make your activities interesting and enjoyable.
- **Staffing the event.** Choose appropriate personnel to staff each activity at the event. Use experts from outside your organization when appropriate to lend weight and knowledge to an issue.
- **Be creative.** Use creative titles for your activities, such as "What's Buggin' You?" for a stream macroinvertebrate identification booth. Ask a local band to play, organize a fly fishing demonstration, or arrange to have costumed characters or local celebrities talk to kids and have their pictures taken with them. At the Southern Maine Children's Water Festival, local TV and radio personalities serve as emcees in a water trivia contest. The arrangement gets kids interested in participating and enhances media coverage at the same time.
- **Use cosponsors.** Identify cosponsors early to help support various aspects of the event, such as paying for promotional items, sponsoring a booth, or providing food or music. Solicit cosponsors by offering to include their names and logos on all the event

Passport to your watershed

Water quality managers in Rockdale County, Georgia, organized a watershed fair to educate citizens about the development of a new watershed management plan. The county teamed up with several local businesses to produce giveaways and staff the fair. A local developer paid for the production of watershed stickers, while a local paper company provided and staffed a recycling exhibit at the fair. The county also worked closely with the local news media to cover the fair and other events related to the watershed management plan in a series of newspaper articles.

At the fair, county residents and students were given watershed passport booklets in which they received stamps for completing various activities, such as solving a watershed knowledge crossword puzzle, identifying stream macroinvertebrates, and marking which subwatersheds they live in by placing push pins on large subwatershed maps.

In 2000 the county received an award from the Georgia Water & Pollution Control Association for the Best Public Education Program for a large utility. The award cited the county's foresight in creating a public outreach strategy to guide the program and the success of the watershed fair.



materials. Select your cosponsors wisely. Make sure they are well liked and trusted by the members of the target audience. You wouldn't want to ask a local paper product company that's been involved in litigation for environmental rule-breaking to support your tree-planting festival!

- **Encourage future participation.** Provide reminders or incentives for participants to continue their good stewardship at home or at work. Bookmarks and refrigerator magnets serve as prompts to remind people of actions to improve or protect water quality while at home. Pledge cards can be used to gain small commitments that participants will change their behavior permanently. For example, in Whatcom County, the Washington Department of Ecology developed a pledge program that encourages residents and businesses to reduce watershed pollution through activities such as redirecting downspouts away from impervious surfaces and leaving grass clippings on the lawn. By signing up, residential participants receive a personalized "To Do List" to hang on their refrigerators and a recycled glass suncatcher. Businesses receive recognition in local publications and a pledge plaque to display in their stores or offices.

Field trips

Providing tours and field trips for members of the target audience—especially elected officials, watershed committee members, and the media—is a great way to communicate your message. What would have taken more time to explain on paper or in words often can be conveyed more easily and more powerfully through field trips to farm demonstration sites, stream restoration sites, or backyard wetlands. Field trips allow people to see for themselves how your water quality improvement efforts are making a difference or what still needs to be done. River Network sponsors a River Rally workshop each year for its partners to meet colleagues, talk to funders, and keep staff and volunteers of river organizations up-to-date on the latest watershed issues. The workshop includes whitewater rafting, canoeing, fishing, and wildlife viewing field trips. The Saugus River Watershed Council in Massachusetts also sponsors a series of canoe trips to gain support for improving the natural resources of the watershed.

Open houses

An open house allows the public to tour a facility or displays at their own pace. No formal presentations are made. This method works well if you're trying to educate the public on multiple issues at once or collect public comments and feedback. Open houses foster one-on-one communication and build the credibility of the organization or issue. Keep in mind that open houses can be more staff- and resource-intensive than other public meetings, depending on the number and kind of displays used and the type of information being presented.




Public hearings and meetings

Public hearings—formal meetings with scheduled presentations—provide an opportunity for the public to make formal comments on an issue or document. Public hearings are often required when government agencies develop new rules or regulations or make some other proposal that might affect the public. However, public hearings do not allow for dialogue among the commenters and the presenters, which often creates an “us versus them” setting. In addition, because many people are not comfortable speaking in front of a group, comments received might be biased toward more outgoing groups or individuals. Public meetings are less formal than public hearings and often include presentations coupled with question-and-answer sessions. Although public meetings on charged issues might spark more debate than education, most allow open, friendly dialogue among participants and presenters.

The stakeholder roundtable is another effective way to provide education and discuss issues with concerned citizens. It is also an excellent forum for networking and sharing practices, and the atmosphere of the roundtable can be one of openness and continuous learning. In 2001 EPA provided Total Maximum Daily Load (TMDL) Listening Sessions for the public to help improve understanding of the TMDL program from all perspectives and to identify and discuss ideas for addressing issues in the TMDL program. People were provided an opportunity to talk in small groups with the help of facilitators.

Targeted events

Events focused on a specific activity can help generate support for your cause by providing the target audience with hands-on experience that will help them understand the specific water quality problem or issue. Volunteer stream cleanups, household hazardous waste pickup days, photo contests, nature walks, workshops, wildlife watches, or other hands-on activities can be used to generate awareness of your issue, communicate your message, recruit people to support and distribute your message, and motivate participation in sustainable behaviors.


The Bear Creek Watershed Project focused on area schools by hiring a professional playwright to form a theater troupe called the Bear Creek Players. The group of actors performed at schools and at area festivals (including the Water Fest), presenting short skits centered on water quality issues. The stories gave members of the target audience a better awareness of different issues in the watershed.  *Check out the Getting In Step video.*

These types of events are best carried out with the support of one or more cosponsors. Teaming up with local conservation districts, businesses, or environmental organizations can bring more people to the event, help defray the cost of the materials or staff needed for the event, and lend credibility to your cause.

Water Fest keeps growing



The Bear Creek Watershed Project hosts an annual water festival called Water Fest. It started in 1993 with about 50 participants; in 2002 more than 300 people attended. A new activity is added each year. Kids love collecting bugs in Bear Creek and then sorting them. One year the project organizers added a Mexican folk dancing group, which brought out members of the Hispanic community that hadn't participated previously. Water Fest holds a pancake breakfast before the festival every year to attract a crowd.

 *Check out the Getting In Step video.*

Tips for better bumper stickers



- Check popular sizes before finalizing your design (and you might want to make sure they fit in mailing envelopes)
- Present a brief message in large, bold letters and keep graphics simple and recognizable
- Attach a mock-up to a bumper to ensure readability

Tips for better T-shirts



- L, XL, and XXL are the most popular sizes
- Select 100% cotton or a blend of recycled cotton and other post-consumer recycled materials. For instance, Fortrel EcoSpun is made from recycled plastic bottles and is just as comfortable, durable, and attractive as cotton
- Don't forget the popularity of long-sleeved varieties in cool climates
- Explore options in shirt and ink colors for variety
- Get quotes from several suppliers and estimate quantities carefully to avoid overstocks
- Use your logo and watershed name
- Try to get a picture of a local celebrity wearing your shirt
- Caution: Dated materials are harder to sell after the event

Giveaways

Most everyone loves getting free stuff! Whether it's pens or coffee mugs, they are often snatched up quickly. See the list under "What to Give Away" for some ideas. Giveaways are good for promoting watershed organizations, simple actions, and general awareness. They show others that the participant is actively involved in the cause, helping to create social norms and encouraging others to get involved.

Giveaways are also visual prompts that remind people to choose behaviors that protect and improve water quality. A toothbrush imprinted with the message "Turn off the water while you brush!" will remind people to conserve water every time they pick up their toothbrushes. Try to make your giveaways more successful, make sure the message they convey is related to the type of giveaway handed out and that the item will be used repeatedly when the person needs to choose the most appropriate behavior.

Giveaways vary greatly in cost and desirability. Most expensive and more desirable giveaways can be reserved for rewarding a certain level of participation or commitment. Examples include T-shirts or baseball caps for event organizers or runners that raise money for an environmental cause and coffee mugs or beach towels for volunteers at storm drain marking events or stream cleanups.

When choosing a giveaway, keep in mind the alternative message it might send—for example, "too much plastic is being used"—which could counteract the environmental benefit of the message. And keep the target audience in mind. Don't give away golf balls with your logo to elementary school kids!

What to give away

- | | |
|------------------------------|--------------------------------|
| • Bumper stickers | • Tablecloths |
| • Calendars | • Bottle openers |
| • Temporary tattoos for kids | • Buttons and lapel pins |
| • Bookmarks | • Totebags/canvas grocery bags |
| • Refrigerator magnets | • Salt & pepper shakers |
| • Stickers for kids | • Pennants or flags |
| • Pens and pencils | • T-shirts |
| • Pop-up sponges | • Frisbees |
| • Caps | • Baseball caps |
| • Mugs | • Rulers |
| • Beach towels | • License plate frames |
| • Beverage holders | • Toothbrushes |
| • Key chains | • Rubber jar openers |
| • Barbecue aprons | • Note pads |
| • Hot pads and oven mitts | • Compasses |

Tips for better giveaways

- Check with a printer to see if your design can be reproduced effectively and inexpensively on a number of different materials
- If you're developing a two-color design, make sure it also reproduces well in black-and-white
- Allow plenty of time for design, production, printing, and distribution
- Carry the design theme or logo throughout all literature and accessory items
- Consider packaging method and costs for mailing or other distribution
- Check with an advertising specialties company for ordering in quantity
- Conduct a program to market or distribute the products



Bumper stickers

Bumper stickers are highly individualized traveling billboards, which means that some people love them and others are turned off by them. (Some people collect them but will not display them on their vehicles.) Because many Americans spend considerable time on the road, chances for message exposure through bumper stickers are excellent. Keep your messages positive and focused on the objective (e.g., Save the Bay!). Composition is easy: Combine a catchy message with a piece of art or a simple background, and you're in business. Production options include everything from print shops to silk-screening in a garage. Choose a design that can be seen from a distance and a color that will beckon from a bumper. Bear in mind that bumper stickers are usually much better at raising awareness than at promoting behavior change.

T-shirts and promotional items

T-shirts and caps are popular items and “really get around” to help spread your message. Use your imagination or work with a graphic artist on how best to conceive, design, and distribute them. Be sure to carefully consider cost, and don't be overly optimistic on sales income because sales rarely achieve expectations.

You can also order any number of other customized items emblazoned with your logo and message. Prices go down with quantity, but make sure you'll be able to distribute your supply within a reasonable amount of time.

Mascots

An effective way to communicate your message to the younger set is through mascots. Mascots become familiar faces that can take on personalities, stories, and “lives” of their own. Consider adapting child-friendly people or critters into puppets, comics, posters, banners, displays, festivals, parades, calendars, contests, skits, student lessons, or activities.

Ollie the Otter

Ollie the Otter was born June 12, 1996, at the Cheyenne Mountain Zoo in Colorado Springs, Colorado. The Central Wyoming Regional Water District in Casper, Wyoming, and Colorado Springs Utilities both use Ollie to teach kids about the water cycle, water treatment and distribution, and water conservation and protection.

Ollie has made community appearances, thrown out the first pitch at a baseball game, and even ridden in parades. Ollie says, “Every Drop Counts.” To find out if Ollie can visit your community, visit www.csu.org/water/ollie/about.html.



RiverSmart Web site

RiverSmart, a national public education campaign from River Network, shows people how simple changes in their everyday activities can help protect rivers. In addition to widespread TV, radio, and newspaper ads, the organization hosts an attractive and practical Web site. The site provides interactive games for kids and parents, a tip sheet for protecting water quality at home, and downloadable samples of numerous PSAs. Visitors can also send free electronic postcards to friends and family and sign up for the RiverSmart newsletter. For more information, visit www.riversmart.org.

The Internet

Increasingly, the Internet is becoming a powerful means of communication. According to a 2001 Nielsen/Netratings survey, 58 percent of Americans have Internet access in their homes. It provides worldwide access to hundreds of thousands of sites containing millions of documents, chat rooms for special interest groups, and database/mapping features that are almost mind-boggling. Web sites can reach large audiences with relatively minimal effort.

Although the Internet is used regularly and extensively by agency personnel, environmental group leaders, and the business community, average citizens still get the great bulk of their environmental messages from more traditional venues—especially the TV and radio news media. Remember, too, that a Web-based approach is very narrowly segmented, so the odds that you will be able to reach your intended audience solely through the Web are not good. Many groups find that approaches based on the news media, targeted presentations, printed materials, events, and giveaways are effective ways to draw the audience to a Web site.

Tips for designing a Web site

- Keep it simple to keep download times short. Surfers will move on quickly if the site takes too long to view.
- Use colors and fonts that are easy to read.
- Provide contact information, including mailing address, phone number, and e-mail.
- Use a few attractive graphics to make your site more interesting.
- Make sure the site can be viewed properly with both Netscape and Internet Explorer.
- Be sure to use alternate text tags (image tags) for photos and graphics for better accessibility. Consider the accessibility of your Web site by testing it at bobbywatchfire.com. Bobby is an accessibility software tool designed to help expose and repair barriers to accessibility and encourage compliance with Section 508 of the Rehabilitation Act. Section 508 requires that federal Web sites allow users with disabilities to have access to the same information as those without disabilities. Even if your organization is not a federal agency, ensuring that your site is accessible by all members of the target audience will broaden the reach of your campaign.
- Limit the use of plug-ins like RealTime or Shockwave that have to be downloaded. If a free plug-in like Adobe Acrobat (for viewing PDF files) is necessary, include a link to the page where that plug-in can be downloaded.
- Make your site interactive by including hotlinks, online quizzes, or other features that draw interest. Remember that surfers tend to scan a site for only 10 seconds before they move on.
- Update your site frequently! A stagnant Web site will lose the audience quickly. When developing your outreach plan, build in time (and resources) to maintain an up-to-date Web site with press releases, new monitoring data, and support.



Registering a domain name

When you're ready to develop your organization's Web site, a few simple steps can help you get started. You may use free Web site hosts that allow you to use their domain to host your site (e.g., www.geocities.com, www.orgsites.com), but in the long run it's better to register your own domain. When choosing your site's name, try to pick a domain that's easy to identify with your group and easy to remember. If your organization has a long name, think about using an acronym or abbreviation that can be remembered easily. There are many domain registrars on the Web with varying services and fees, such as www.hostapalooza.com and www.registernames.com. Each site provides a chance for you to enter the Web site name you want and takes you through the registration steps. Search around to find the one most appropriate for your organization. Fees range from \$8 to \$70 for the first 2 years, with additional (slightly lower) annual fees until your Web site is removed.

Designing your Web site

Designing an attractive, interactive Web site is crucial if you want the target audience to visit your site often. If your organization already has a homepage you can link to and a Web programmer in-house, soliciting that person's services will be the most affordable option. If not, several software packages, such as Macromedia Dreamweaver and Microsoft FrontPage, allow you to design a Web site without having to learn any complicated programming languages. Other options include hiring a Web site design firm if funding is available, or recruiting college students majoring in information technology.

Unique Web sites

Following are several Web sites that might provide inspiration when designing your organization's site:

- Water Saver Home, <http://h2ouse.org>
- Washington Department of Ecology Polluted Runoff Page, www.ecy.wa.gov/programs/wq/nonpoint
- San Diego BayKeeper, www.sdbaykeeper.org
- Lake Champlain Basin Program, www.lcbp.org
- Water on the Web, wow.nrri.umn.edu/wow
- Colorado Water Protection Project, www.ourwater.org
- Maryland Department of Natural Resources, www.dnr.state.md.us
- Florida Community College Consortium for Pollution Prevention, www.fc3p2e.com



Building Blocks:

Package the Message

With the message "Fertilize in the Fall. That's All!" in hand, the hypothetical Herndon County now needed to choose the package that would be most effective. Since most members of the audience are homeowners who do not have much time to spare, the county needed to identify the time of day that most of the audience would have the greatest attention span—during their commute and at night while watching TV.

By reviewing a recent subway transit survey conducted by the Greater Herndon/Carlisle Metropolitan Transit Authority, the county learned that more than 60 percent of county residents ride the subway twice a week or more. The county therefore developed five eye-catching subway transit posters centered around its fertilizer reduction campaign. The posters were displayed over the course of 6 months. The transit poster artwork was also used for full-size educational posters and water bill inserts.



On the Web...

To design Web sites that attract the audience and keep them coming back, understand that people don't read Web pages like they read the paper. The *Communicators Guide* (govinfo.library.unt.edu/npr/library/papers/bkgrd/communicators.html) notes the following:

- Reading rates slow by 25 to 40 percent, so don't include lengthy blocks of text
- The monitor's flicker causes eyestrain
- Almost 80 percent of readers scan text; only 20 percent read every word
- Readers scan a site for about 10 seconds before they click on something else, so make your text count. Put the most important and interesting information near the top of the page

Marketing your Web site

Once your Web site is online, it's time to promote it to the public! Publicizing your Web address—the Universal Resource Locator, or URL—to the target audience is the most important step in developing a Web site. Many organizations overlook this step, essentially wasting their Web sites' potential. Send information on your site to newsletters, organizations, listservers, or other Web sites that the target audience frequents. Include the URL on all your outreach materials—letterhead, giveaways, brochures, and so forth.

You can add the URL to many online search engines such as Yahoo, Google, and Infoseek. You can register with each one individually for free or use a service like Microsoft bCentral Submit It at www.submit-it.com to submit your listing to about 20 search engines for a 1-year fee of \$49. All you'll need to do is select about 20 keywords for the search engine to use. Even if you don't register, within a few weeks many search engines will catalog your site automatically.

Keep in mind that each search engine searches in a different way. For example, the Excite search engine looks at the words on the main pages of the Web site, whereas AltaVista looks at only page titles and meta tags (keywords listed in the Web site's HTML code to help search engines locate your site).

Partnering with other Web site hosts

There are opportunities to reach other audiences through the Internet by using interest group Web sites (e.g., off-highway vehicle users, anglers, farmers). However, you'll probably reach national audiences through such Web sites, not necessarily the citizens of your watershed. Explore these sites before deciding to use them in your program.

The Internet is becoming more important to local watershed outreach efforts by the month. Its primary value lies in providing access to general water science information, databases like EPA's Surf Your Watershed (www.epa.gov/surf) and those hosted by other public agencies, and environmental news from state and national groups like the Conservation Technology Information Center at www.ctic.purdue.edu.

Consider asking to have your Web site's URL added to other organizations' links pages. This approach increases the number of visitors at your Web site without costing an arm and a leg. Visit various related Web sites and send them e-mails with a request to add a link to your site on their site. Offer to add their link to your site as well. This is one of the easiest and cheapest ways to spread your message.

Using listservers

E-mail is the preferred communication medium among many citizens, business people, and agency officials because it can be accessed at convenient times and provides a written record of the communication. Active watershed projects often find it useful to establish e-mail lists through the help of a listserver to keep participants updated on meetings, policy discussions, and other matters. Implementing this communication link is simple and allows stakeholders to keep abreast of developments at their leisure.

Establishing an e-mail list is not difficult. It can even be in the form of a “round robin” exchange, where list members are the designated recipients of the first message and simply press “reply to all” to post messages to the entire group. Many state and federal government agencies already host lists in-house, and you might be able to add a new list to their server easily. Other independent organizations might choose to start lists through Web sites.

Majordomo is a free program that automates the management of Internet mailing lists. Commands are sent to Majordomo by e-mail to handle all aspects of list maintenance. Once a list is set up, virtually all operations can be performed remotely, requiring no intervention on the part of the list manager. Visit www.linuxwebmasterfree.com/majordomo.html for more information. Other sites that offer free lists and online message boards include groups.yahoo.com, groups.msn.com, and www.topica.com.

What does it cost?

Outreach campaigns can be costly and labor-intensive, especially those that use TV PSAs, special events, printed materials, videos, or targeted mailings. The table on page 76 provides estimated costs for some types of outreach materials. Contact individual vendors for actual prices.

When you defined your goals and objectives in Step 1, you determined available funding and staff members for the project, as well as potential partners. This is a perfect opportunity for your partners to lend a hand (or funds). Ask them to volunteer to pay the production or shipping costs of materials. For more information on how to obtain funding or in-kind services, refer to Part 2: Implementing the Campaign.



EPA discussion lists

EPA's nonpoint source pollution and septic system listservers host lively discussions on issues of interest to watershed groups. Visit www.epa.gov/epahome/listserv.htm to learn how to subscribe to both.

Costs for various outreach materials

Category	Item	Cost (per 1000) *
Giveaways	Magnets	\$300 for 2-color business card size
	Posters (11" x 17", 4 colors, glossy paper)	\$1,000
	Canvas Tote Bags	
	1 color, 2 sides	\$3,100
	2 colors, 2 sides	\$3,850
	Stickers (one color, 3" diameter)	\$300
	Lapel pins	\$1,150
	Key holders	\$1,500
Printed materials	Printed fact sheets (2-sided)	
	1 color	\$600
	2 colors	\$840
	4 colors	\$960
	Trifold panel brochure (11" x 25.5")	
	1 color	\$1,600
	2 colors	\$2,100
	4 colors	\$2,400
Category	Item	Cost (per item)
Display booths	Tabletop	\$500–\$800
	10' x 10'	\$1,500–\$2,500
Bus advertisements	Panels on bus interior (bus boards)	\$100–\$150 for 1–12 months on 20–60 buses (production costs vary from region to region)
	Vinyl panels on entire bus exterior	\$1,250/month per bus (fees may be higher in large metropolitan areas; production costs vary from region to region)
Billboards	Billboard	\$700–\$1000/month
Web sites	Register domain name	\$8–\$70 for first 2 years
Newspaper ads	4" x 6" ad	\$300–\$5,000
Movie theaters	30-second PSA	\$1,400/week in 16 theaters
Other	Stock photos on a CD-ROM	\$30–\$400

**Notes: These costs are only estimates. Contact individual vendors for actual prices.
2003 prices*



PROCESS CHECKLIST

Step 4: Package your message

- ☐ Am I getting the message to my target audience with this format?
- ☐ Is the format appropriate for the message?
- ☐ Is the format appropriate for the target audience?
- ☐ Does the format exclude any members of the target audience?
- ☐ Does the format favor any members of the target audience?
- ☐ Does the format grab the attention of the target audience?
- ☐ Do I have the resources necessary to prepare and use the selected format?
- ☐ Do I have access to the skilled staff needed to prepare and use the selected format?
- ☐ Will I have enough time to produce and distribute this format?
- ☐ Will I be able to distribute messages in this format effectively?
- ☐ Will I have enough materials for the entire target audience?

Step 5: Distribute the message

Once the message has been packaged in the desired format, you can proceed with distribution. Fortunately, you've already considered distribution mechanisms somewhat while researching the target audience and selecting a format. Further activity during Step 5 includes taking a close look at the level of time, resources, and work required for distributing the message. Are you going to mail all those posters? Do you need to buy mailing tubes? Do you have the addresses? Better still, is there an existing publication you can piggyback onto so you can reach the target audience without the hassle of mailing anything yourself?


What's in Step 5

- Who delivers the message?
- Size does matter
- Timing is everything
- Staffing the effort
- Piggybacking your message

Common means of distribution are by direct mail, door-to-door, by phone, through targeted businesses, during presentations, as hand-outs at events, through media outlets, and by posting your message in public places. Consider which distribution method(s) is best for your group. Local governments, for example, might choose to add inserts to utility bills, whereas local community groups might prefer door-to-door visits.

Who delivers the message?

In addition to how you are going to deliver the message, you should decide *who* will deliver the message. Analysis of the target audience can help you determine who the most trusted members of the community are. An organization trusted by the public can use a staff representative of its own. If the organization is a government agency, it might be effective to have a member of the target audience deliver the message. Many groups select local celebrities, news reporters, or other respected members of the community to be their spokespersons.

The organizers of the Pequea-Mill Creek project in Lancaster County, Pennsylvania, had their work cut out for them when trying to reach the farmers with their message. Project staff knew that the farmers would be tough to sway if the message came from the wrong person. Rather than using only participating local, state, and federal staff, they asked local veterinarians interested in water quality and herd health to get involved. The vets spoke to the farmers in the area and encouraged them to implement the recommended BMPs. The organization also used the farmers themselves to help spread the word. They formed teams of two or three farmers and took them to participating farms, where the farmer teams talked about the BMPs and their pros and cons.  *Check out the Getting In Step video.*

The ripple effect

By building partnerships with diverse members of the community, you can educate them first on the issues, and then they can communicate this information to their constituents. For example, ranchers are more likely to believe information and accept recommendations from other ranchers than they are to believe information from another source.

Peer pressure can be a good way to encourage positive lifestyle changes. As mentioned in Step 2 and in the box to the right, the Empowerment Institute's Sustainable Lifestyle Campaigns use neighbors to create social cohesiveness and get citizens involved. Five to six neighborhood households—an EcoTeam—meet several times over a 4-month period, with the help of a step-by-step workbook and a trained volunteer coach. The team members support each other in reducing waste, conserving water and energy, buying environmentally protective products, reducing air and water pollution, and encouraging other neighbors to get involved. Consider using the residents of the community as a good option for spreading your message.

Size does matter

The mail

The mail delivery system can be the best distribution vehicle if the target audience can be defined geographically or if you have access to a mailing list that encompasses your audience (e.g., developers, teachers). The U.S. Postal Service (USPS) has established procedures for bulk mailings, and it's advisable to contact the post office early to discuss the pros and cons of this delivery approach. For more information on bulk mail, visit www.usps.gov.

Post cards

Post cards are an inexpensive way to expose the target audience to your message immediately. When cards arrive in the mail, there's no envelope to open.

You might think that your mail is a card because it's a single sheet of paper. But to qualify for USPS post card rates, a card must be rectangular, at least 3½ inches high by 5 inches long by 0.007 inch thick, and no more than 4¼ inches high by 6 inches long by 0.016 inches thick. Stickers, magnets, and other items should not be attached to postcards. The USPS has strict rules about attachments.

Letters

Your organization can use letters to send surveys, newsletters, posters, and more. Keep in mind that the USPS is very specific about its requirements. To be eligible for mailing at the standard postage rate for First-Class letters, a piece must be rectangular, at least 3½ inches high by 5 inches long by 0.007 inch thick, and no more than 6 inches high by 11½ inches long by ¼ inch thick. The postal service charges extra postage for mail that's too stiff, too square, or unusually shaped. Such mail can jam postal equipment and make processing difficult. These problems cost the USPS time and money—and could ruin your mailing.



Benefits, benefits, benefits!

The Empowerment Institute (www.globalactionplan.org) has developed Sustainable Lifestyle Campaigns in Ohio, Missouri, Wisconsin, Pennsylvania, Washington, New York, Massachusetts, Oregon, and Virginia. Neighborhood EcoTeams are achieving the following average resource savings per year:

- 35 to 51 percent less garbage
- 25 to 34 percent less water used
- 9 to 17 percent less energy used
- 16 to 20 percent less fuel used for transportation
- \$227 to \$389 saved

"I've lived in the neighborhood for 21 years, but getting to know my neighbors started 3 years ago with an EcoTeam. We knew a lot of people by sight, but now we know them much better. There is a lot more friendliness on the streets now. It's given us the feeling of being embedded in the community and having roots. I highly recommend the Neighborhood EcoTeam process."

—Sarah Conn, EcoTeam member in West Newton, Massachusetts

Bulk Mail 101



The USPS offers discounts for bulk mailings because you do some of the work that the USPS would otherwise do. To mail at bulk rates, you need to:

- Get a mailing permit (one-time fee of \$150) and pay an annual mailing fee (\$150 per year)*. To keep your mailing permit active, you must send a mailing at least once every 2 years.
- Pay postage using pre-canceled stamps, a postage meter, or a permit imprint.
- Make sure that your addresses are current.
- Presort the mailings by ZIP code.
- Take your mail to the post office where you hold your mailing permit.

To qualify for bulk mailing discounts, mail at least 500 identical pieces for First-Class (maximum weight of 13 ounces) and 200 pieces for Standard Mail (maximum weight of 15.99 ounces). Identical means they are the same size, shape, and weight.

In addition to bulk mail rates, nonprofit organizations may be eligible for additional mailing privileges. The post office offers nonprofit groups discounted mailing rates. To apply for nonprofit mailing rates, visit the USPS Web site at www.usps.com/businessmail101/misc/nonprofitApplication.htm.

*2003 prices

Another option for mailing larger items (e.g., posters, large newsletters) is to fold them into letter-size pieces. Folded pieces can save time and money because you're not paying for or stuffing envelopes. A good way to close the documents is to use wafer seals or tab stickers. Don't use staples because they can catch in postal equipment.

Large envelopes and newsletters

The USPS uses the words *flats* and *non-letters* to refer to large envelopes, newsletters, and magazines. Whatever you call them, flats must have one dimension greater than 6 inches high or 11 ½ inches long or ¼ inch thick and be no more than 12 inches high by 15 inches long by ¾ inch thick.

The maximum size for a flat gives you plenty of room to put lots of material in the envelope. But keep in mind that the more you put into an envelope, the more it weighs. And the more it weighs, the more postage you pay, especially for First-Class Mail. Is it possible to fold your flat-size piece to letter-size? If so, you can save lots of money because you'll pay the lower letter rate.

Now that you've set up your bulk mail account, to whom should you send your package or your community survey? Make your first stop your organization's mailing list, if you have one that is updated frequently. Direct mail software can help you target mailings to specific ZIP codes. Information on such software is available on the Internet. Search for "direct mail software."

E-mail

A cheaper and faster way to spread the message is through e-mail. Newsletters, flyers, calendars, and more can be sent with the click of a few buttons. A popular software program for creating e-mailable documents to help send your files is Adobe Acrobat (www.adobe.com). Able to convert just about any document into Portable Document Format (PDF), it ensures that your files are displayed and printed the way you intended and can be protected from unauthorized access and alteration. Be sure to keep your e-mail list up-to-date, and don't send more than a few messages a month, or you might risk becoming "spam."

Timing is everything

Once you've figured out how to deliver your message, the next step is to figure out when to deliver it. For a major community event, give the community plenty of time to add it to their calendars. And as described in Step 4, any distribution to involve the media must be sent well in advance.

The response you are looking for from the target audience can affect when you distribute your message. For example, if you have prepared

calendars, you need to have them distributed in November, when people start shopping for the next year's calendar. If you are promoting fall fertilization, residents need to receive the flyers at the beginning of spring before they consider purchasing additional fertilizer, and possibly again in early fall.

Once your message has been distributed, it's very likely that your organization will be deluged with questions from the media, local businesses, schools, and members of the public. Be prepared for both positive and negative comments. Once you get an idea of what they want to know, prepare a list of Frequently Asked Questions for your staff members or volunteers to have on hand.

Staffing the effort

Now that your organization has created a message and chosen its format and means of distribution, the question of resource needs is likely to come up. Think about forming partnerships with local and regional organizations that work on related issues. Also look to businesses and schools that would be interested in providing funding or staff time. Think about tying your message into a business or organization activity already in place to save time, money, and effort.



Building Blocks: **Distribution**

In Step 4 (Package your message), the hypothetical Herndon County developed water bill inserts, subway transit posters, and full-size educational posters. County staff made arrangements with the local water authority to include the water bill inserts in their quarterly bills to county residents. The water authority was eager to oblige because they had been looking for ways to reduce drinking water treatment costs. They knew that if residents were able to significantly reduce water pollution to the local lake (also the county's drinking water supply), water treatment costs would drop.

The county also used a bulk mail account with the postal service to send the posters to targeted audiences (e.g., lawn and garden stores, garden clubs, homeowners' associations, lawn care companies), as well as the local community college.

To help pay for the cost of displaying the posters in the subway, the county teamed up with the Herndon Chapter of Trout Unlimited. The chapter paid the subway poster fee for 6 months and also donated \$1,000 for printing costs.


Meteorologists used to spread the word



Recognizing that television weather forecasters are very effective at explaining complex scientific issues (e.g. Doppler radar) and that they are trusted and well respected in the community, EPA joined with the National Environmental Education and Training Foundation, the American Meteorological Society, StormCenter Communications, and the Center for Watershed Protection in an innovative project to recruit and train broadcast meteorologists to educate their viewers about watersheds.

Chief Meteorologist Bob Ryan with NBC4 in Washington, DC, frequently discusses the Chesapeake Bay Watershed as part of NBC4's watershed project, "Where the Atmosphere Meets the Earth." The partnership's interactive Web site, <http://watershed.interactive-environment.com/main>, provides real-time water quality data, watershed news, quizzes, and related links. Piggybacking their message onto the weather forecast allowed the project partners to reach an already captive audience.

Recruit volunteers

A massive outreach campaign can take up considerable staff time to ensure success. The cost of door-to-door visits, phone calls, and other in-person activities might exceed your current means. The KOPE kids of Utah overcame this barrier by partnering with local artists, biologists, horticulturalists, and others to get the message out in their fight to save Hidden Hollow from development. These people had a special interest in the project that made them willing to volunteer on behalf of the creek.  *Check out the Getting In Step video.*

A large organization might be able to donate staff from other departments until the campaign ends. If funding is available, hire a few interns or an entry-level person. Also look to your partner organizations for additional staff members. They might be willing to pay their employees for their time, saving you valuable funding. It's likely those employees are already involved with and knowledgeable of the issues, saving training time as well.

A more affordable method is to poll for volunteers. Advertise in the newspaper, on the local college campus, or during community events. It's likely you'll run into several citizens who are already interested in the issue, those also known as early adopters. In turn, their increased knowledge and participation will help them spread the news in their peer groups. Ensure success by gathering volunteers from the target audience.

Piggybacking your message

Piggybacking, or attaching your message onto someone else's message, is the easiest and usually most effective way to distribute the message. If the target audience receives a certain periodical or service (e.g., town newsletter, utility bill), it will be more effective to include your message in that publication. For example, if you're trying to reach pet owners, you might want to advertise your message in the local vet's newsletter. It will also increase the likelihood that members of the target audience will actually read your message because they're already familiar with the publication. Piggybacking helps you to reach the audience, and it helps the editor of the host publication generate content for the next issue—a win/win situation for everyone.

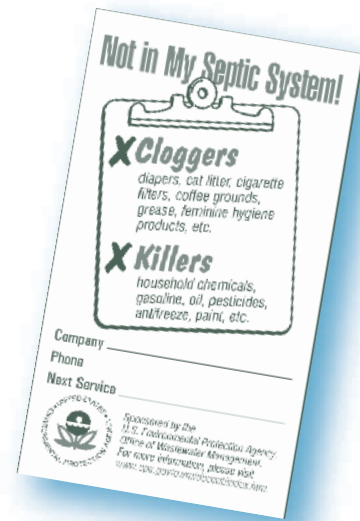
Go on the road

Conferences, workshops, and other events are also ideal for piggybacking because they can be fairly expensive to conduct on your own. If a local kennel club is sponsoring a dog show, ask if you can set up an exhibit on the importance of picking up after pets or if the show organizers are willing to distribute free poop scoopers with your program logo to the attendees. Keep yourself informed of conferences and events in which members of the target audience will be involved, and contact

the event organizers to see how you might be able to piggyback your event or message. Offering staff time and other in-kind services will make your request more appealing to the event organizers.

Work with local businesses

Using selected businesses to deliver your message can increase the likelihood of reaching the target audience and save money on postage. For example, if you develop a brochure on oil recycling, ask to display the brochure at auto parts supply outlets. Keep in mind that businesses will be more likely to distribute your materials if there is an added benefit to them. So if you ask septic tank pumpers to distribute refrigerator magnets containing information on what should and should not go into a septic system, include a space on the magnet for the customer to write down the hauler's name, phone number, and next service date.



PROCESS CHECKLIST

Step 5: Distribute the message

- ☐ Do I have the resources necessary to distribute the message?
- ☐ Will I have enough time to distribute the message?
- ☐ Will I be able to distribute messages in this format effectively?
- ☐ Have I chosen the appropriate marketing method for my message?
- ☐ Am I distributing my outreach materials effectively?

Step 6 Evaluate the outreach campaign

What's in Step 6

- Why evaluate?
- When to evaluate
- Types of evaluations
- Where do I go from here?

Evaluation provides a feedback mechanism for ongoing improvement of your outreach effort. Many people don't think about how they'll evaluate the success of their outreach program until after the program has been implemented. Building an evaluation component into the plan from the beginning, however, will ensure that at least some accurate feedback on outreach program impact is generated. Ideally, feedback generated during the early stages of the project will be used immediately in making preliminary determinations about program effectiveness. Adapting elements of the outreach effort continually as new information is received ensures that ineffective components are adjusted or scrapped, while pieces of the program that are working are supported and enhanced.

Why evaluate?

Outreach programs often involve a tremendous amount of effort and resources, and evaluation will help you build support for on-going funding and save you time and money. Justifying the program—showing how it supports achievement of the overall goals and objectives—means identifying what worked, fixing what didn't, and ensuring that outreach continues to enhance the watershed program. You need to know what worked and why so you can build on it or make adjustments in the future. Perhaps you used foundation or other funds that require a demonstration that water quality actually improved or other measurable progress was made. Whether soliciting funds from private or public sources, you'll be in a much stronger position if you can show that your program worked.

The success of outreach programs depends on how well they're conceived, planned, implemented, and adapted. Evaluating success is not difficult if you initially develop concrete, measurable objectives against which your achievements can be compared. In addition, focusing the outreach effort on discrete target audiences provides a manageable approach for both implementing the outreach program and measuring its success.

When to evaluate

Although evaluation is the final step in a multistep process, it starts at the beginning of the project. As explained in Step 1, evaluation tools must be built into your outreach campaign at the beginning and along every step of the way to ensure that accurate feedback is generated. This method is commonly called adaptive management. Adaptive management is a process for continually improving your goals and objectives, messages, formats, and distribution mechanisms by learning

from the tasks you've implemented. Adaptive management keeps you from charging ahead blindly and being paralyzed by indecision later. It helps you learn from your mistakes and build on your successes.

Because you're selling ideas, attitudes, beliefs, and behaviors with your outreach campaign, not products and services, you won't have product sales goals to help you evaluate your success. Therefore, you need to be in tune with your campaign so you can set measurable benchmarks along the way. Be on the lookout for evaluation opportunities when creating formats or deciding on a distribution method. For example, when you're building a Web site for your campaign, make sure you add a hit counter or are otherwise able to monitor Web traffic so that you can see how many people visit the Web site after PSAs are run on television or after a community event. Don't leave evaluation until the end of the project because you might be out of money by that point.

Types of evaluations

Outreach programs typically have interrelated sets of objectives and tasks linked to a specific goal, such as improving water quality. The goal of the program—improving water quality or, more specifically, reducing phosphorus loadings by half over the next 5 years (for example)—is typically supported by a number of objectives, which might or might not have specific outreach components. An outreach program evaluation reviews the following three sets of indicators:

- *Process indicators.* Indicators related to the execution of the outreach program itself (activity indicators). (e.g., What effect did the effort have on the process? Did people attend the meetings? Did the message get to the media?)
- *Impact indicators.* Indicators related to achievement of the goals/objectives of the program. (e.g., What effect did the effort have on behavior or water quality?)
- *Context indicators.* Indicators related to how the project functions in the community as a whole, how the community perceives the project, and the economic and political ramifications of the project. Context indicators can provide some background and perspective on why certain approaches appear to be working well while others are not. (e.g., Was the effort well received by the public?)

The following table presents a hypothetical set of indicators related to a watershed outreach program. Note that some of the indicators measure direct environmental impact (e.g., phosphorus or solids concentrations), whereas others measure attributes of the process employed to achieve those impacts (e.g., number of workshops). The worksheet in Appendix A (page A-3) can be used to build in evaluation measures for each step when you first develop your outreach plan. Appendix D provides an evaluation worksheet that can be used when evaluating your campaign during and after the steps are implemented.



Mill Creek project combines process and impact evaluation to show results

To evaluate whether stream bank fencing improved water quality, NRCS project staff used several different indicators. Some indicators measured changes in water quality, while other indicators measured how successful they were at reaching the audiences. All of these indicators strengthened their evaluation program so they could make adjustments based on the information collected.

Some indicators measured were the following:

- Number of farmers who showed interest by contacting project staff (impact and context)
- Number of articles published in the local media outlets (process)
- Number of farm tours given (process)
- Miles of stream bank fenced (impact)
- Water quality measurements of suspended solids and fecal coliforms (impact)



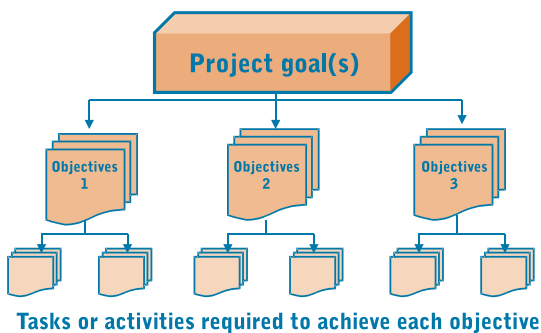
Check out the Getting In Step video.

Examples of indicators for various goals, objectives, and tasks

Goal	Objective	Task/Activity	Indicators
Improve water quality			Overall Indicator: Attainment of water quality criteria and designated uses (impact)
	Objective A: Reduce phosphorus loadings from subwatershed X		<ul style="list-style-type: none"> Reduction in soluble reactive phosphorus concentrations (impact)
		Offer free soil testing to row crop farmers	<ul style="list-style-type: none"> Total acres of soil tested; farmers reached (process) Number of farmers applying fertilizer based on soil tests (impact)
		Conduct workshops for homeowner lawn care	<ul style="list-style-type: none"> Number of workshops held; total attendees (process)
	Objective B: Reduce erosion and sediment from construction sites		<ul style="list-style-type: none"> Target: 40 percent decrease in total suspended solids and turbidity measurements (impact)
		Train job site superintendents in proper erosion and sediment control practices	<ul style="list-style-type: none"> Number of training sessions held; total number of attendees (process) Pre/post tests on knowledge of erosion and sediment control practices (impact)
		Conduct random inspections of construction sites to review erosion and sediment control practices	<ul style="list-style-type: none"> Inspections conducted; resulting scores; referrals of low-score sites to training program (impact) Inspection score trends over time (impact)

Process evaluations

Process evaluations focus on implementation of activities as they relate to budget requirements, schedules, staff resources, and tasks or activities. Process evaluation occurs as the program is being implemented, early enough in the outreach delivery process to allow modifications before too many resources have been expended. Evaluating planning processes and program activities as they occur increases the likelihood that outreach programs will achieve their objectives. The evaluation resembles a plan-do-check-act procedure.



Process evaluations help determine whether sound objectives were developed, target audiences were properly analyzed, and appropriate messages were crafted. Continuous evaluation during the planning and implementation process helps clarify program objectives and keeps activities sharply defined. Evaluations can also occur after completion of each step in the process by reviewing the proposed plan with staff and analyzing decisions at each phase or after each task or activity. Conducting cursory pretests of materials on representative samples of the target audience and confirming tests with focus groups also provide valuable evaluation information.

This sort of “early warning system” can include logging the costs of specific activities, checking the frequency of material distribution, making contact with distribution outlets to see if materials were received in a timely manner, reviewing media clippings to determine how news releases and articles are being published, monitoring the number of responses to messages (attendees at an event, responses to surveys, callers to information lines), tracking workshop attendance registration, and gathering information through focus groups or surveys to determine distribution effectiveness.

Impact evaluations

Impact evaluations assess the outcome or impacts produced by the outreach program and are directly tied to the original objectives. This type of evaluation measures the effect of an outreach program on the target audience by asking, “To what extent did we achieve our objective?” Typical performance measures under impact evaluations include increased awareness, knowledge of an issue, changes in perceptions or behavior, repeat participation in a targeted activity, and goal-oriented measures of water quality improvements. Be aware that sometimes unintended outcomes can result from an outreach program, and if there is evidence that such outcomes are prevalent, the evaluation can attempt to capture and define them so the program can be revised.

Hotlines help in evaluation



The Bear Creek Watershed Project in west Michigan set up a hotline for homeowners' associations to use when they see that builders or residents aren't complying with the new stream buffer ordinances. Project organizers monitor the number of calls received.



Check out the Getting In Step video.

Georgia surveys elected officials to focus coastal outreach efforts



The recently implemented Georgia Coastal Management Program (GCMP) was faced with the challenge of educating a rapidly growing public about the natural resources on which its sought-after quality of life is based. Because most land use decisions are made at the local level, much attention has been focused on local government and elected officials.

To develop a personal relationship with those local officials, staff from the GCMP conducted face-to-face surveys with more than 80 of them. “We asked them what the most important natural resource issues were in their communities and how they thought the Coastal Management Program should focus its efforts,” said Beth Turner of the GCMP. The results showed that 75 percent of local government officials recognize the importance of protecting groundwater resources from saltwater intrusion and contamination, but only 25 percent of the officials mentioned nonpoint source pollution as a natural resource issue for their communities. “We know that nonpoint source pollution is a widespread problem in our coastal area, and the fact that the elected officials are not aware of it shows us where to concentrate our outreach efforts,” Turner stated.

— Beth Turner, Georgia Coastal Management Program

Measuring impact in Hawaii



In 1995 the City of Honolulu developed an environmental education program to increase citizens' understanding of nonpoint source pollution so that they would change their behaviors and business practices. Honolulu's campaign included a series of TV PSAs featuring local and national celebrities.

In 2001 the city conducted a telephone survey to measure awareness and the impact of the program. Of those contacted, 63 percent agree that major pollution of the ocean and streams is caused by rainfall moving over and through the ground and carrying away pesticides, fertilizers, and other pollutants (up from 53 percent in 1995). The survey also showed that people are learning about many of the new programs: 78 percent have seen a stenciled storm drain, and 45 percent have heard of the Adopt-A-Stream program. (www.cleanwaterhonolulu.com)

Assessment tools for impact evaluations consist of focus groups, surveys, interviews, and, of course, actual measurement of improvements in water quality. A common impact evaluation tool is to compare behaviors, attitudes, or beliefs of the target audience before and after the outreach program is implemented. If you intend to use the pretest/posttest approach, it's critical to obtain target audience baseline information on the issues linked to the program objectives before the outreach program is implemented so comparisons can be made.

Design your pretest and your program with the end result in mind—attainment of the objective, whether it be related to knowledge or awareness of an issue or a change in behavior (e.g., adopting BMPs). When planning an impact evaluation, it's important to clearly identify the time frame for measuring results because the true impact of a number of programs is realized long after the activities have ceased. It can take 7 to 10 years for water quality improvements associated with the implementation of BMPs to be detected.

Another impact evaluation approach is direct measurement of actions taken by the target audience. For example, if your outreach program encouraged residents to leave grass clippings on their lawns, you could measure the amount of yard waste going to the landfill before and after the program is implemented. Oil recycling can be measured by tracking recycled oil dropoff trends at area collection centers. The Empowerment Institute's Sustainable Lifestyle Campaign, which uses neighbor-to-neighbor outreach to encourage natural resource conservation and protection, measures success in terms of household utility cost savings.

Setting targets in terms of the indicators that will be used during the evaluation provides a yardstick against which progress can be measured. For example, the target value for total suspended solids and turbidity might be 40 percent less than current readings. A target for soil testing might be to test 80 percent of all row crop fields within 300 feet of a waterway.

Targets should be ambitious but not unattainable. For example, the multistate Chesapeake Bay Agreement of 1987 set targets of 40 percent reductions in phosphorus and nitrogen inputs by 2000. Neither goal was obtained, but the work performed in pursuit of the goals did result in significant nutrient reductions: about 80 percent of the targeted reductions were achieved.

Context evaluations

Finally, examining contextual information related to the audience, the outreach program, and the watershed issues under study can




provide some perspective on what's working, what's not, and why. Assessing how the project functions within the economic, social, and political environment of the community helps to uncover aspects of the objective, message, audience, format, or distribution mechanism that might be affecting results. For example, choosing an inappropriate messenger can compromise the success of a project regardless of other factors. Other community or cultural factors can also play a huge role. Such factors include perceptions that one group is bearing a disproportionate burden for correcting water quality problems, cost-share funding eligibility criteria are unfair, or preferential treatment is being afforded to some stakeholders. Focus groups that examine the social, economic, political, and cultural context of your project can identify problems that weren't noticed during the planning or execution phase.

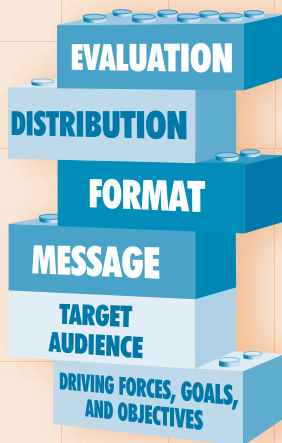
Care must be taken when designing evaluation tools to ensure that targeted variables are being accurately assessed. It is often difficult to trace water quality improvements directly to a specific program or action, just as it is difficult to attribute purchasing behavior to a specific advertisement or product attribute. A little creativity, some insight, and a variety of different perspectives are important ingredients for designing evaluation programs.



Measuring impact in San Diego

The City of San Diego conducts an annual phone survey that reaches about 450 households to determine changes in behavior and increased awareness of watershed issues. This impact evaluation provides the information the city needs to help shape its Think Blue stormwater media campaign for the next year, including deciding where to put their resources and what issues they need to focus on.

 Check out the *Getting In Step* video.



Building Blocks: Evaluation

After running the transit ads for 6 months, distributing the water bill insert in two bill mailings, and distributing more than 500 posters, the hypothetical Herndon County conducted a post-project, random-digit-dialing survey of county residents to measure the impact of its "Fertilize in the Fall. That's All!" outreach campaign on local attitudes and behaviors. The county found that 70 percent of county residents were aware that lawn fertilizer is a significant contributor to local water quality degradation (a 50 percent increase from pre-campaign estimates). In addition, more than 55 percent of residents said they planned to change their fertilizer habits and fertilize only in the fall.

**PROCESS CHECKLIST*****Step 6: Evaluate the outreach campaign***

- ☐ Do I have a baseline on the target audience's behaviors, beliefs, and attitudes?
- ☐ How will I know whether the target audience has received the message?
- ☐ What tools will be used to assess the impact of the outreach campaign?
- ☐ Can those tools be used if the campaign changes?
- ☐ What will be done with the results of the evaluation?
- ☐ Who will be responsible for tracking budgets and schedules?
- ☐ Do I have the resources to conduct pre/post survey or evaluation techniques?
- ☐ Is the outreach campaign accountable to the public, government agencies, another organization, or other funding sources?

Where do I go from here?

Congratulations! You've just completed all the steps necessary to develop an effective, executable outreach plan. Use the worksheets in Appendix A to help organize your plan and identify possible gaps. In "Part 2: Implementing the Campaign" you'll learn how to put your plan into action.



Part 2: Implementing the Campaign

In Part 1 you learned about the six steps of outreach and how to develop an outreach campaign plan. In Part 2 you'll learn some tricks of the trade to get you started on implementing the campaign you've planned.

Developing an operating plan

From the outreach plan you developed in Part 1, you need to create a “to do” list in tabular format (like the one on page 92) to figure out who's going to do what and by when, and to identify how much each task will cost. This table will become your day-to-day operating plan. Don't worry if there are holes in the table. You can beef up staff numbers by forming partnerships with other local agencies and organizations, and you can increase your budget by applying for grants or obtaining in-kind services. Tips are provided below to help you secure additional resources—both people and dollars.

The key is to outline your operating plan based on what will achieve the objectives in the overall campaign plan you developed in Part 1. When you first create the table, focus on the activities and the time frame needed. If you determine that you can't complete the activities because of lack of funding or staff, you can make choices to scale back certain activities or phase in activities over time. You can find a blank operating plan matrix to use in implementing your campaign at the end of Appendix A.

What's in Part 2

- Developing an operating plan
- Scheduling
- Determining resources and support
- Keeping up the momentum
- Overcoming barriers to success
- A final thought

Sample Operating Plan Matrix

Goal: Increase awareness of residential nutrient runoff and encourage behaviors that will reduce nutrient pollution in local streams and lakes.					
Objective: Post educational posters in Greater Herndon/Carlisle Metropolitan Transit Authority subway stations.					
Activity/Product	Evaluation Indicators	Time Frame/Due Date	Responsible Party	Resources Needed	Status/Comments
Develop 5 posters for 7 subway stations and post them.	<ul style="list-style-type: none"> Number of posters hung Number of hits on county Web site before and after posters are hung Post-project random phone survey to measure impact of posters 	<ul style="list-style-type: none"> Contact subway authority: <i>February 1</i> Develop text/theme for each poster: <i>February 15</i> Develop layout: <i>March 17</i> Send to printer: <i>March 24</i> Hang posters: <i>April 1 (prior to Earth Day)</i> 	Communications director of county Water Division in Public Works Department	Staff time 40 hours Dollars <ul style="list-style-type: none"> Printing: \$2,000 (\$1,000 to be donated by Trout Unlimited) Subway ad fee: \$300 for 6 months (possibly donated by transit authority) 	Communications director will contact Greater Herndon/Carlisle Metropolitan Transit Authority director to inquire about procedural requirements and whether they might be willing to waive subway fee for 6 months.
Objective: Educate local businesses about proper nutrient management by developing and implementing a speakers bureau.					
Develop slide show, handout materials, and evaluation form	<ul style="list-style-type: none"> Based on evaluation forms collected, how well the materials were received 	<ul style="list-style-type: none"> Develop draft slide show text: <i>January 17</i> Identify appropriate photos: <i>January 17</i> Develop 1-page evaluation form: <i>January 21</i> Submit materials to reviewers: <i>January 22</i> Finalize all materials and make copies: <i>January 31</i> 	Public affairs assistant	Staff time 60 hours Dollars Handouts: \$10 Name tags: \$5	Try to have a good mix of business types in each presentation.
Conduct three 2-hour presentations	<ul style="list-style-type: none"> Number of attendees at presentations How many presentations were made How many follow-up phone calls were received because of information presented Based on evaluations, whether attendees benefited from the presentations 	<ul style="list-style-type: none"> Make initial calls to businesses to gauge interest: <i>January 10</i> Secure meeting locations: <i>January 20</i> Send invitations: <i>January 27</i> Conduct presentations: <i>February 19–21</i> 	Public affairs assistant to schedule presentations Community liaison to give presentations	Staff time Schedule presentations: 15 hours Presentations: three 2-hour presentations (6 hours) Dollars Meeting facility (donated by local businesses) Pizza and soft drinks for meeting: \$50	At presentations, look for attendees that could be potential presenters for future presentations.

Scheduling

Your day-to-day activities can be translated into a working calendar. Update it frequently and provide it to your workgroup. You can show when items need to be mailed, who needs to be called, when press releases have to be e-mailed, and so forth.

Determining resources and support

Once you've started filling in your operating plan and your working calendar, you'll know why determining available resources and support to implement your campaign is the next critical step. You'll need three basic things to launch your campaign: staff, technical support, and financial support. Do you have the resources to conduct the background research to develop your plan? Do you have the resources to implement your plan? If your plan is larger than your budget, think about ways you can alter the plan or consider looking outside your organization for support. In addition, consider forming partnerships to pool funding and expand potential impact. Partnerships can often help sustain an effort after initial seed money has been spent.

How partnerships can help

Environmental issues are often too complex and too expensive for one group or organization to tackle on its own. That's where partnerships can be useful. A partnership is a voluntary collaboration of agencies, organizations, or other groups or individuals that have joined to work toward a common goal. Partnering can play an instrumental role in the success of your campaign. In times of shrinking budgets and increased public demands, many agencies can benefit from the resources and support that cross-agency, public-private, and private sector partnerships can offer.

Partnerships have many advantages, including providing access to resources; increasing effectiveness, efficiency, and public influence; allowing for creativity and innovation; and improving communication between typically adversarial parties. Partners can also offer staff, access to and support from their membership, publicity, political influence, or financial resources. In addition, partnerships lend credibility to your effort when you're seeking funding and delivering your message.

Partnerships can be structured formally, informally (loosely organized), or somewhere in between. Formal partnerships are those established by law, initiated through formal public agency action, or incorporated under the laws of a state. Most formally organized watershed groups are nonprofit organizations that meet the charitable, education, scientific, or other requirements outlined for tax-exempt corporations under Section 501(c)(3) of the federal Internal Revenue Code.

Media partners help carry the load

When tasked with increasing public awareness and understanding of watershed issues, the Lake Champlain Basin Program (LCBP) turned to its local NBC television affiliate, WPTZ, in February 1999. WPTZ's broadcast region nearly mirrors the Lake Champlain watershed, reaching 600,000 residents of New York, Vermont, and Quebec. After several scoping meetings, WPTZ and the LCBP began a unique partnership: Champlain 2000.

Champlain 2000 promotes successful projects that protect and enhance the Lake Champlain Basin's water quality, natural resources, and cultural heritage through various television promotions. The LCBP's outreach staff provide story concepts, contacts, and further information about each story on the Web site (www.lcbp.org). Although WPTZ maintains all editorial control, the news team solicits the LCBP's help to maintain a balanced viewpoint in all stories. News stories cover issues like urban lawn and garden runoff, buffer strips, and volunteer watershed groups. By leveraging outreach staff time with WPTZ's estimated \$200,000 commitment to Champlain 2000, the LCBP is increasing awareness and understanding of watershed issues at a minimal cost.

Informal partnerships can accomplish a lot even though they're more loosely organized than formal partnerships. Some partnerships might form as logical outgrowths of your objectives. For example, if one of your objectives is to create door hangers with tips for homeowners, the local Girl Scout council would be a logical partner to help strengthen the message and distribute the flyers. Although informal groups might not be eligible to receive as many grants or resources, by aligning themselves with nonprofit organizations or public agencies, they can often find access to funding without having to go through the hassle of setting up a corporation or applying for tax-exempt status—allowing them to focus instead on the issue of concern.

Where to find partners

State or local environmental organizations should be the first place to start looking for partners. Identify local organizations likely to be interested in watershed issues, such as the local Farm Bureau, the Boy Scouts or Girl Scouts, local stormwater utilities, or watershed and other environmental organizations. Then look to local agencies and organizations charged with protecting water resources, such as sanitation districts, planning commissions, water authorities, or other county or municipal government agencies. Federal, state, regional, or local agencies might also have programs with goals and objectives similar to yours. Federal agencies like EPA, the U.S. Fish and Wildlife Service, the National Park Service, and others are often looking for ways to partner with local governments and the private sector to help them get more bang for their environmental buck. They see local agencies, nonprofits, and private organizations as credible sources of local environmental expertise. Smaller and more local interests can offer the ability to generate public buy-in that often can't be obtained by the federal government.

Businesses tend to look for projects that help the communities where their employees live or where their customers purchase and use their products and services. Businesses can be persuaded to take part in the partnership to improve their public standing and eventually increase their profits. Also, sometimes businesses are required to give away a percentage of their revenue every year to various causes. Why not to your cause? Many private firms jump at the chance to donate what they consider “small potatoes” (\$500 to \$2,000) to pay for giveaways, event space, or printed materials in return for positive press coverage.

Securing funding

Although partnerships can help spread the workload and provide some resources, eventually you might discover that you need to secure additional funding to launch various aspects of your watershed campaign. Develop a project expense budget sheet or use the “Resources Needed” column of the sample operating plan matrix shown on page 92 to list all of the required goods and services you'll need, along with an estimate of the cost for each. Don't forget to include

travel expenses, supplies, and vendor services, in addition to direct labor. Also note the in-kind services your project partners have offered. Once you know what you have and what you need, you can set out to secure funding to take up the slack.

Whether you decide to apply for grants, solicit donations, or tap into in-kind services from potential project partners, funding sources can be found in all sectors. The more sources you identify, the better your chances of finding the funding you need to meet your campaign objectives.

Foundations

Because foundations are legally required to donate at least 5 percent of their assets each year to qualify as foundations, being in the right place at the right time can put you on the receiving end of such donations. Be sure to check each foundation's guidelines and deadlines for funding proposals. In addition, most foundations have specific mission statements, so make sure when applying for funds that your application focuses on their needs and goals. Visit The Foundation Center (<http://fdncenter.org>) on the Internet to learn about foundations in your area. For a small fee you can access an online searchable foundation directory to search more than 70,000 grantmakers and more than 150,000 grants. If you don't have Internet access, you can get a copy of the database on CD-ROM by calling (212) 620-4230.

Nonprofit organizations

Nonprofit organizations, professional societies, and associations might also be willing to provide financial support for your campaign. The Chronicle Web site (www.philanthropy.com) includes articles and grant announcements from nonprofits. You can search the Chronicle database to find out what funders have provided money for projects like yours in the past. The site also provides links to information on fundraising, volunteerism, technology, academic centers on philanthropy, and publications for nonprofit professionals.

Federal funding sources

Hundreds of federal agencies and organizations provide grants and other assistance to aid in watershed protection projects. The primary advantage of federal grants is that state and local governments and other eligible recipients do not have to use their own resources to pay the specific eligible costs that the grant monies cover. Some grants, specifically challenge grants, are designed to help you leverage resources or raise more money. For example, an agency might provide a grant on the condition that you match it, dollar for dollar, with donations from your members.

For a complete listing of federal funding sources, visit the Catalog of Federal Domestic Assistance (www.cfda.gov). This Web site provides access to a database of all federal programs available to state and local governments; federally recognized Indian tribes; domestic public, quasi-public, and private profit and nonprofit organizations and institutions;

In 2001 environmental organizations received \$6.41 billion in financial support from individuals and foundations. Developing a partnership can be a valuable tool to help your group tap into new funding sources.

—Giving USA 2002 (American Association of Fundraising Counsel's Trust for Philanthropy)

Getting help

Many organizations are willing to provide in-kind services like

- Accounting/bookkeeping
- Legal counsel
- Fundraising support
- Advertising/public relations advice and support
- Staff training
- Clerical support
- Facility maintenance
- Facility use
- Equipment use
- Transportation
- Volunteers

Innovative state funding sources

Section 319 Nonpoint Source Success Stories Volume III highlights the on-the-ground success of EPA's Clean Water Act section 319 Nonpoint Source Program. In addition to featuring success stories from each state, the report includes a special section on innovative state funding mechanisms such as bond initiatives, low-interest loan programs, grants, and land acquisition programs.

Programs highlighted include Georgia's Greenspace Program—a voluntary, noncompetitive, county-based program that provides grants to eligible counties if they develop and implement plans to permanently protect at least 20 percent of the county's geographic area as natural, undeveloped greenspace. Pennsylvania's Growing Greener grant program, which has funded 55 watershed assessment and protection plans, restored 3,603 acres of wetlands, and cleaned up 279 miles of streams affected by acid mine drainage is also described. The report is available on the Web at www.epa.gov/owow/nps/Section319III.

specialized groups; and individuals. You can use a variety of search mechanisms to find funding sources for your campaign. The site provides eligibility requirements, information on application and award processes, and proposal criteria for each funding source. The catalog can also be obtained in print by calling 1-866-512-1800.

EPA's online Federal Funding Database for Watershed Protection (www.epa.gov/watershedfunding) is also useful. The Web site gives users access to a database of approximately 100 programs offering financial assistance (grants, loans, cost-sharing) specially geared toward watershed-related projects.

Keep in mind that applying for grants can sometimes be costly and time-consuming. Grant writing requires trained staff to determine grant opportunities and submit detailed grant applications. The awarding organizations often take months to process applications and award grants. Even then, because of the intense competition for the limited pool of grant funds, state and local governments and other potential recipients might find it increasingly difficult to acquire funding for projects.

State funding sources

Most state environmental, wildlife, or parks agencies offer grant or loan programs (or both) to protect and enhance state environmental resources. For example, the Michigan Department of Environmental Quality's Community Pollution Prevention Grant Program provides \$500,000 in grants to local governments and planning agencies to establish innovative, sustainable pollution prevention practices. In addition, all states provide grants for the control and prevention of nonpoint source pollution through EPA's Clean Water Act Section 319 Grant Program (www.epa.gov/owow/nps/funding.html). These grants can fund local field days, demonstrations, tours, workshops, and other educational events and activities that promote the implementation of best management practices to protect water quality. State education agencies also offer grants that can be used for environmental education and outreach, especially classroom education. Keep in mind that most state grants require some percentage of local matching funds. Also, the funds might not be available to all organizations.

Local and private funding sources

Banks and some corporations offer charitable donations that can help support your campaign. According to the American Association of Fundraising Counsel's Trust for Philanthropy, corporate contributions were 4.3 percent (more than \$9 million) of all giving in 2001. Amazingly, however, most of the charitable money donated to nonprofit organizations by the private sector comes from individuals; only a small portion is given by foundations and corporations. In fact, the estates of those who have passed away contribute more money each year than all U.S. corporations combined.

Leveraging Resources

Making the money you have go further is always a challenge, but it can be done. Here are a few examples of how to leverage resources:

- **Look to partners.** Identify in-kind services that partners or others can contribute, such as volunteer labor, free publicity, food or beverages donated for events, transportation, and technical or legal advice.
- **Buy some ad space and get some more for free.** For example, as mentioned in Part 1, Step 4, the City of San Diego leveraged the media spots it purchased for more than \$250,000 to get local broadcasters to contribute 774 free airings of its PSAs.
- **Quid pro quo.** Offer benefits to those from whom you need help. For example, if you'd like the local newspaper to print educational newspaper inserts on your watershed festival for free, offer to list it as a sponsor on all festival materials, offer exclusive interviews on the festival for the paper, and offer the opportunity to have a vendor booth at the festival at no cost.
- **Let others do the work for you.** Train the people that are most likely to act on and spread your watershed message through train-the-trainer workshops. For example, teach local Master Gardeners how to adopt integrated pest management practices to minimize using harmful pesticides. In exchange for the training, ask trainees to conduct at least three workshops on their own to train their friends and neighbors. If you need help developing a watershed logo but can't afford to hire a design firm, ask the local high school art department to host a logo contest. Offer the winner recognition in the local paper along with a \$500 college scholarship.

Keeping up the momentum

Achieving a substantial change in behavior doesn't happen overnight. It might take months or even years before you're able to evaluate whether your outreach campaign encouraged behavior change. This lack of immediate results can sometimes discourage campaign organizers to the point that the campaign fizzles out. This discouragement can be worsened when campaign organizers move on to other jobs or out of the area. One way to keep the momentum going throughout the life of an outreach campaign is to set small, achievable goals throughout the process. These mini-milestones can be used to show success and keep your project energized.

Overcoming barriers to success

All of us have experienced failure, and watershed campaigns are no different. It's how you learn from the failures that is the true measure of long-term success. Following are several barriers that can keep your campaign from being successful. Understanding what they are, how to recognize them, and how to overcome them will give your campaign the strength it needs to be sustainable. As your campaign progresses, look for areas of concern and respond accordingly. Adapting your program during implementation to adjust to changing conditions is highly recommended.





Tips to keep your project's wheels in motion

- **Develop a slide show or create a 1-page fact sheet to keep the process going.**
- **Use environmental indicators—tools to simply and quickly measure environmental improvements (such as Secchi disk measurements or miles of stream bank revegetated)—to communicate progress rather than complicated indicators like biochemical oxygen demand.**
- **Identify and commit the resources needed to achieve your objectives early in the process. Running out of money is probably the number one reason why watershed campaigns fail.**
- **Consider piggybacking your messages onto communication formats produced and distributed by partner organizations.**
- **Work with the news media to distribute your information. Regular communication with newsletter editors and media reporters about what you're doing, who's involved, and why you're doing it usually reaps benefits.**
- **Continue to recruit new campaign partners and leaders to avoid burnout and ensure a continual flow of new ideas and resources.**
- **Build networks with other organizations in the community that are working on water quality issues. Working in coalition with other groups results in new energy and new ideas.**

Poor coordination and planning

Many times failure of a campaign is the result of starting off on the wrong foot. Most often that means stepping forward with no clear strategy or plan on paper for how to conduct a watershed outreach campaign. Your efforts will be in vain if you don't sit down with all of the key players in the beginning and define your goals, identify your target audience, determine your messages, decide on the formats and distribution mechanisms for those messages, and figure out how you intend to measure your success. And it's not enough to just talk about it. Write it down. Whether it's 3 pages or 300 pages, a well-defined written strategy will ensure that everyone involved agrees on how the project will be conducted and who is responsible for doing what.

The very nature of working at a watershed level requires that you coordinate with all the counties, cities, organizations, and stakeholders in the watershed when developing a watershed outreach campaign strategy. If you don't have all of the correct stakeholders involved from the beginning, you can't be sure that your campaign will address all of the local social, economic, political, and ecological conditions that must be considered in developing an effective plan. In addition, involving the right key players from the beginning builds trust and support for the project, distributes responsibility, creates more innovative solutions, and is more cost-effective. Including all the necessary stakeholders in watershed efforts is critical to achieving behavior change among those stakeholders. Remember: People don't resist change; they resist being changed. Everyone finds it easier to support ideas they've had a hand in developing. Consider how you can involve the people whose behavior you ultimately want to change.

Lack of communication

When the right hand doesn't know what the left hand is doing, your outreach campaign will fizzle out. Be sure to keep everyone involved in conducting the campaign informed about issues that arise during various campaign stages, changes to the original strategy, and lessons learned along the way. In addition, be sure to let people know when you achieve successes, whether small ("We got 50 hits on our new Web site within an hour of the launching!") or large ("Within 3 years after we started our 'Fertilize in the Fall. That's All!' campaign, the amount of nitrogen entering the lake had decreased by 30 percent").

Political wrangling and changing regulations

Politics plays a role in everything. If the chair of the county board of commissioners supports the goals of your watershed campaign but is replaced by a less-supportive commissioner, your campaign could screech to a halt. Successful watershed groups usually avoid

political wrangling and contentious public debate by working quietly and individually with stakeholder groups to address disagreements in a satisfactory manner. For example, who pays for cleaner water is at the crux of many discussions, but nearly all studies on public willingness to pay for better water quality show overwhelming support for higher fees, taxes, and water/sewer bills if it means cleaner water. Identification of key public values, alliances with likely supporters, and aggressive outreach and education programs targeted at important stakeholder groups and the public can help generate support for watershed initiatives and ease resistance among those who will share the financial costs—usually, the public.

Regulatory changes also require close communication among stakeholder groups, the regulated community, and elected officials. Changes in local zoning ordinances, permit requirements, or other regulations might affect your campaign. Watershed groups can help regulators stay abreast of the changing regulatory scene by meeting periodically with agency staff, discussing upcoming issues, and offering support for educating key players in the regulatory field and among the regulated community. Stay on top of local politics—who talks to whom and who supports what.

Fear of the unknown

The fear of failing at the daunting task of watershed education and behavior change can cause delays in getting the job done. Likewise, “paralysis by analysis” has ossified many well-intentioned people who aren’t comfortable making a decision until the data overwhelmingly confirm the chosen actions. In the real world, we make lots of decisions (buying a vehicle, selecting a college, etc.) with far less data than optimally preferred. There will always be unknowns: people might resign from your staff to accept other jobs, a tanker spill could occur in your watershed, funding could dry up, and so on.

Collecting data and using them to plot a course are important. However, don’t be so distracted by your research or fear of the unknown that you fail to pursue your objectives aggressively. Remember Admiral David Farragut at the battle of Mobile Bay: despite facing the new torpedo technology, he went on to win the battle.

Letting money drive the process

Although your budget might be limited, developing a plan that fits your budget can be a nearsighted approach. Don’t skimp on your goals, but try to match your group’s resources to their role in attaining those goals. If you include those goals in the original plan, you’ll be prepared once these resources are obtained down the road. Also, along the way you might develop partnerships that provide funding for planned activities you thought you could not afford.

Working together

For tips on working with stakeholders, reaching consensus, and resolving conflict, read *Getting In Step: Engaging and Involving Stakeholders in Your Watershed*. It’s available on the Internet at www.epa.gov/owow/watershed/outreach/documents.



Funding for watershed projects is usually limited. Groups often find themselves chasing limited dollars. The funding “tail” might wag the project “dog” if you don’t take precautions. Successful projects identify the types of actions needed to protect or restore watershed health and then pursue funding or other support for those actions. When opportunities come along for low-priority activities, careful consideration is required to determine whether chasing this funding and executing the associated nonessential tasks will detract from previously identified—and important—activities. Passing on funding that would reorient your entire project or distract your group from key actions identified to protect or restore the watershed might be tough, but sometimes it’s necessary to maintain your focus, momentum, and progress toward your group’s established goals.

Letting the process bog you down

Means are as important as ends, but take care to avoid letting the process become the goal. Momentum is lost when too much time is spent on the process rather than the project. This phenomenon is summed up in the postmortem report “death by meeting.” People don’t mind attending meetings if they’re necessary, short, and results-oriented. However, meetings that occur only because “it’s the third Tuesday of the month” and drag on for hours without any clear sense of purpose are the death knell for stakeholder-based groups. Involve people, communicate, and take time to meet occasionally, but beware of situations where your volunteers are spending more time in meetings than on watershed work. Most action occurs outside meetings. That’s where people are needed, and that’s where they usually want to be! Keep up the momentum by making participation fun and exciting.

A final thought...

We hope this guide and the accompanying video have inspired you to go out and start your own watershed outreach campaign. Remember that there are no hard-and-fast rules. These tips are provided to help you get started, give you some new ideas, or provide more information to expand your program. The most important thing is to believe in your goal and work hard to meet it.

We’d love to hear how you used this guide, what you liked or didn’t like, and the lessons you learned while conducting your outreach efforts. Please send us your comments through the feedback link at www.epa.gov/nps/outreach. Good luck!

Appendices

- Appendix A** Building Blocks Worksheets
- Appendix B** Identifying and Removing Barriers to Behavior Change
- Appendix C** Behavior Selection Matrix
- Appendix D** Outreach Campaign Evaluation Questions
- Appendix E** Want to Know More?



Appendix A:

Building Blocks Worksheets

Sample Summary Sheet					
Driving Force: Serious water quality problems, including phosphorus and nitrogen overloading due to urban runoff, sedimentation and erosion, bacterial contamination, and flooding due to impervious surfaces.					
Goal: Increase awareness of residential nutrient runoff and encourage behaviors that will reduce nutrient pollution in local streams and lakes.					
Objective: Reduce nutrient runoff from residential and commercial areas.					
Objective	Target Audience	Message	Format	Distribution	Evaluation
Increase awareness of residential nutrient runoff by 25 percent within 1 year and encourage behaviors that will reduce nutrient pollution in local streams and lakes.	Homeowners and associations' apartment/landscape managers	Fertilize in the Fall. That's All! With slow-release or organic fertilizers, you need to fertilize only once in the fall to help your grass grow new roots and store nutrients for next year's growth.	5 subway transit posters Full-size educational posters Water bill inserts	Subway transit system Bulk mail	Post-project, random-digit-dialing survey of county residents

Summary Sheet

Driving Force:

Goal:

Objective:

Objective

Target Audience

Message

Format

Distribution

Evaluation


Evaluation				
Steps	Context			
Goal and Objective				
Target Audience				
Message				
Format				
Distribution				

Operating Plan Matrix						
Goal:						
Objective:						
Activity/ Product	Evaluation Indicators	Time Frame/Due Date	Responsible Party	Resources Needed		Status/Comments
				Staff time	Dollars	
Objective:						
				Staff time	Dollars	
				Staff time	Dollars	

Knowing why people do things and what might make them change a particular behavior will help you identify the most appropriate ways to convince the target audience to adopt the behavior you're recommending. Use this worksheet to help uncover the barriers to behavior change so that you can remove or minimize the barriers before you develop your message. Answer the questions in the Barriers column on the left; then circle the ways you intend to remove or minimize the barriers in the Barrier Breakers column on the right. (Be creative! Develop new Barrier Breakers for your situation and add them to the list.)

Why?

- Subsidize the cost.
- Find a cheaper way for the audience to engage in the behavior.
- Use partners to offset the costs.
- Provide incentives to encourage the behavior.
- Piggyback onto an existing activity to lower the cost.





If it's too expensive for homeowners to install permeable-pavement driveways, offer reduced tax assessments to help offset the cost and act as an incentive. Another idea would be to work with homeowners' associations to sign up individual homeowners and pool them together for discounted bulk orders.

Physical or Economic Barriers

 Because planting trees along streamside property is both time-consuming and expensive for homeowners, partner with a local nursery to provide discounts to anyone planting trees for this purpose. Promote the nursery in your effort, and provide tip sheets on how and when to plant the trees.

 If shoppers exhibit an unwillingness to buy recycled products, encourage them frequently with positive messages about how important it is to "close the recycling loop." An annual, month-long "Get in the Loop" campaign in Washington State reminds shoppers to buy recycled products through in-store promotional materials and identifies specific recycled-product choices right on the store shelf.

 When recruiting local Girl Scout troops to conduct a beach cleanup, hold a mini trash-pickup training session to show them things to avoid (such as used syringes and toiletries) and when to ask for adult help.

 To combat the stigma associated with the real or perceived health risks of picking up pet waste, use humor when developing your message and formats.

Physical or Economic Barriers

Does it take more physical effort to perform the recommended behavior than the opposing behavior?

Why?

Does the recommended behavior present a risk to the health and safety of the target audience or their family members (e.g., area designated for stream cleanup in or near known gang hangout, poison ivy, or fears of disease-causing organisms)?

Why?

Barrier Breakers

- Piggyback onto an existing activity to lower the effort required.
- Provide physical or monetary assistance to promote the behavior.
- Provide monetary rewards or recognition to encourage the behavior.
- Highlight others in the target audience engaging in the behavior to show that it's not as difficult as perceived.

- _____
- _____
- _____
- _____

- Educate the audience on real and perceived risks.
- Remove risks by offering safety tips.
- Provide statistics to show real risk levels.
- Provide security.
- Provide preventive health services (e.g., hepatitis shots, etc.).

- _____
- _____
- _____
- _____
- _____

Physical or Economic Barriers

Is it difficult to get the information or resources needed to adopt the behavior?

Why?

Barrier Breakers

- Educate the audience on how to adopt the behavior.
- Make it easy to get the resources or information needed by posting it online, providing alternative locations to obtain materials/information, and taking needed materials/information to the audience.

- _____
- _____
- _____




Are there other physical or economic barriers?


(Please list.)

- _____
- _____
- _____
- _____
- _____
- _____
- _____



If you're promoting soil testing to homeowners to prevent overfertilization, provide free soil test kits, available at select locations or by sending an e-mail request to the county soil and water conservation district.

 Make it socially acceptable to have a not-so-lush lawn by finding homeowners willing to use alternative vegetation or reduce their fertilizer use and asking them to post signs on their lawn that say they have a water-friendly yard.

 Work with local schools to develop household hazardous waste education campaigns. Have students take home "Nontoxic Home" pledge forms to ask parents to commit to reducing their reliance on toxic household products. After the parents have committed to this small pledge, ask them to make a larger commitment by hosting a community Household Hazardous Waste Pickup Day at the school. Provide stickers for parents to place on products that say "toxic," "recycle," or "save" to serve as prompts for the whole family.

Social or Psychological Barriers

Is there social pressure to avoid the behavior?

Why?

Is the behavior contrary to community norms?

Why?

Is there fear of social disapproval or rejection for performing the behavior?

Why?

How do members of the target audience feel they might be perceived by their peers if they adopt the recommended behavior?

Why?

Is the behavior consistent with the target audience's self-image?

Why?

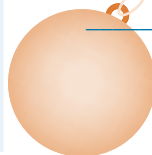
Other emotional or psychological barriers?

(Please list.)

Barrier Breakers

- Research current community norms and reasons for those norms through focus groups.
- Develop messages that make it seem socially desirable to perform the behavior.
- Provide frequent and strategically placed prompts to remind people of the behavior.
- Identify early adopters in the community, and partner with them to spread the word and convince others to adopt the new behavior. They can help develop new social norms that include environmental behaviors.
- Use community gatherings and events to show that social pressure is perceived and not real.
- Clearly communicate the percentage or number of people that are currently engaging in the recommended behavior.
- Try to gain small commitments from members of the target audience to engage in "easier" behaviors before asking them to adopt the "harder" behavior. Sociologists and marketers agree that getting people to say "yes" to something small makes it easier for them to say "yes" to something larger later on because people like to be viewed as consistent. (Remember: Written commitments are more effective than verbal commitments.)

- _____
- _____
- _____
- _____
- _____



Knowledge Barriers

Does the target audience need to learn new skills to perform the behavior?

Why?

Barrier Breakers

- Provide training on the new behavior.
- Recruit early adopters to demonstrate the new behavior in daily activities, at events, or during training sessions.

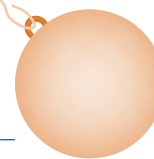


Create train-the-trainer sessions for volunteer stream monitors so that they can train others and expand the volunteer pool.

Does the target audience know the benefits of the recommended behavior?

Why?

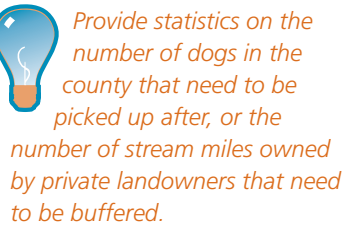
- Show the immediate consequences of both adopting and not adopting the behavior; convey consequences (positive and negative) in your message.



Does the target audience know the impacts of the opposing behavior?

Why?

- Identify and communicate actual or estimated environmental, social, or economic impacts (e.g., statistics, before-and-after photos) of the opposing behavior and the recommended behavior.

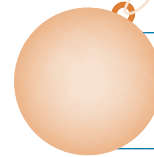


Does the target audience believe that individual actions are not significant enough to improve the environment?

***Are there other knowledge barriers?
(Please list.)***

- Provide statistics on the collective impacts of individual actions.

- Provide statistics on the collective impacts of individual actions.



Appendix C:

Behavior Selection Matrix

Before you complete the Behavior Selection Matrix, take a few minutes to review the following questions. Remember: There are no right or wrong answers to the questions in the matrix. The answers are mostly subjective and will depend on the circumstances surrounding your locality's issues and concerns.

Which behavior will result in the highest reduction in pollution?

Based on information you have regarding current water quality or environmental conditions in the project area, try to determine which of the behaviors you listed will result in the greatest reduction in pollution if a large majority of the target audience adopts the behavior.

Which behavior will be the most affordable to promote to my audience?

Consider both the short-term and long-term costs that your organization might incur while trying to promote the adoption of this behavior. Think about the costs of outreach materials and formats, how the materials will be distributed, and who will help you distribute them. Consider whether you'll be able to defray some of the costs by piggybacking onto existing efforts. For example, if you're promoting the use of alternative landscaping designs to conserve water resources in a particular community, is there an existing community newsletter you can use to distribute your message? If so, you will be able to save yourself the expense of printing and distributing your own materials.

Which behavior will be the most affordable for my audience to adopt?

Estimate all the costs that an average member of the target audience will incur when adopting the recommended behavior. Think about expenses related to gas, wear-and-tear on vehicles, the cost of taking time off from work to get to the recycling facility before it closes, expenses associated with alternative or green products (which are usually more expensive than conventional products), and so forth.

Which behavior is the most attractive to the people in my community?

Think about which behavior most resembles current community norms and attitudes. Which one will make people seem like smart, savvy neighbors?

For which behavior will it be easiest to show a link to the problem?

Because most people don't fully understand the link between what they do at home and the quality of our environment, being able to show a clear cause-and-effect relationship between behaviors and their effects on the environment is very important. Agricultural demonstration projects have been a successful in helping people make connections between behavioral changes and environmental results. For example, by planting trees and other vegetation along stream banks, farmers

can prevent rapid stream bank erosion. If farmers that have vegetated their stream banks invite their neighbors to come and see how their experiment has slowed erosion, the other farmers might be convinced to do the same on their land. Showing a link for other behaviors might require more complex strategies. For example, because it's difficult to see a septic tank leaking or to understand the impact lawn fertilizer can have on a waterbody, it could be more difficult for people to accept that their behavior might be negatively affecting the environment.

Which behavior is the most sustainable?

Which behavior will promote a solution that will have the greatest pollution reduction effect over the greatest amount of time? Does one behavior eliminate the problem, or does it simply reduce the impact that problem might have? Educating homeowners about the proper type and amount of fertilizer to apply on their lawns will reduce the amount of nutrient runoff into streams, but encouraging alternative landscaping in place of a lawn could eliminate the need for lawn fertilizer altogether.

Which behavior will have additional water quality benefits?

Sometimes it's possible to kill two birds with one stone. If your community develops a septic system maintenance plan to reduce the amount of nutrients entering a waterbody from faulty systems, it is likely that bacteria levels will decrease as well. Multiple water quality benefits also could result from encouraging homeowners to landscape with native plants. Natural landscaping can reduce the amount of water homeowners need to use for watering their lawns, decrease the use of yard fertilizers that can result in runoff of excess nutrients to streams, and even reduce the amount of stormwater runoff that occurs during rain events. To determine additional water quality benefits a behavior might have, consider whether the behavior addresses a source of multiple pollutants or the possible effect reducing one pollutant might have on other pollutants common in the environment.

Which behavior will get the highest consumer response?

Consider the ways in which each behavior will affect the consumer. If homeowners are educated about the amount and type of fertilizer their lawns need, the homeowners are likely to purchase the correct type of fertilizer if it could reduce their cost or the amount of time needed to apply the fertilizer. Also, a product advertised as environmentally friendly is more likely to be purchased if it is reasonably priced. If such products are noticeably more expensive, however, the benefit of their being environmentally friendly might not affect the consumers' actions.

Which behavior has the fewest barriers to overcome?

There are many reasons why a person might not adopt sustainable behaviors. The behavior might be too costly to implement, the person could be unaware of the potential benefits of certain behaviors, or he or she could feel pressured by peers to behave in a certain way. To gain a better understanding of the potential barriers people face, fill out the worksheets provided in Appendix B.

Behavior Selection Matrix										
Objective:										
Evaluation Questions										
Score from 1 to 6 (1 being the least likely; 6 being the most likely). Note: Behaviors may receive the same score if applicable.										
	Which behavior will result in the highest reduction in pollution?	Which behavior will be the most affordable to promote to my audience?	Which behavior will be the most affordable for my audience to adopt?	Which behavior is the most attractive to the people in my community?	For which behavior will it be easiest to show a link to the problem?	Which behavior is the most sustainable?	Which behavior will have additional water quality benefits?	Which behavior will get the highest consumer response?	Which behavior has the fewest barriers to overcome?	Total Score (sum of columns 1–9)
Behavior										

Instructions:

1. Score each behavior based on the evaluation questions (1 being the least likely; 6 being the most likely).
2. Obtain behavior score by adding the scores for each question.
3. The behavior with the highest score is the recommended behavior.

Appendix D: Outreach Campaign Evaluation Questions

Process Evaluation

Are the planned activities being implemented according to schedule?

Is additional support needed?

Are additional activities needed?

Do some activities need to be modified or eliminated?

Are the resources allocated sufficient to carry out the task?

Did the target audience receive the materials distributed?

What feedback has been received, and how does it affect the remaining outreach campaign objectives and activities?

How do the technical activities related to the campaign issues affect the campaign?

Impact Evaluation

Were the campaign objectives achieved?

Did the campaign change the behavior of the target audience members?

Are there measurable improvements in water quality?

Context Evaluation

Was the campaign right for the target audience?

Did it effectively address watershed issues for the target area?

Did the campaign compete with other social or economic issues?

Were the formats and messages appropriate?

Was the campaign controversial?

Appendix E: Want To Know More?

This appendix provides information on additional sources of outreach materials, watershed management planning, media relations, and other tools that might be useful to your program. Although this list is by no means inclusive, it represents some of the best materials available. Wherever possible, a contact, phone number, and Web site information are provided.

Developing an outreach program

Bridge Builder: A Guide for Watershed Partnerships (Facilitator's Handbook)

The purpose of this handbook is to make the facilitation of watershed planning and management as easy as possible. Many exercises, transparencies, forms, checklists, and other sources of information and examples are included throughout the text. To obtain a copy of this handbook, contact Conservation Technology Information Center, 1220 Potter Drive, Room 170, West Lafayette, IN 47906-1383. Phone: (765) 494-9555; Fax: (765) 494-5969, Internet: www.ctic.purdue.edu.

Community Culture and the Environment: A Guide to Understanding a Sense of Place

Produced by EPA, this guide provides a process and set of tools for defining and understanding the social and cultural aspects of community-based environmental protection. Contact the National Service Center for Environmental Publications at (800) 490-9198 or e-mail ncepimal@one.net and ask for publication number EPA 942-B-01-003.

Conservation Partnerships Field Guide

This field guide to public-private partnering for natural resource conservation is designed to help both the novice and the experienced practitioner successfully use partnerships as equitable, effective, and efficient means of achieving results. It includes an overview of projects and partnerships. The field guide is available from the U.S. Fish and Wildlife Service, Office of Training and Education, 4401 North Fairfax Drive, Arlington, VA 22203, or call (703) 358-1711.

Designing an Effective Communication Program: A Blueprint for Success

This handbook will guide you through the crucial steps involved in designing an environmental communication program. From designing your program to increasing the effectiveness of communication materials, this guide has it all. It's available through the University of Michigan, School of Natural Resources and Environment, Ann Arbor, MI 48109, at (734) 764-1817.

Directory of Funding Sources for Grassroots River and Watershed Conservation Groups 2001–2002

The directory profiles foundations, corporations, state and federal agencies, and nonprofits that support small, nonprofit watershed groups, as well as a few sources that support tribes. It includes contact information, grant sizes, and a brief description of each source's particular interests. Contact River Network at (800) 423-6747 or www.rivernetwork.org.

Environmental Partnerships: A Field Guide for Nonprofit Organizations and Community Interests

This guide introduces partnerships and explains what makes them successful and how to make them grow. It's available from the Management Institute for Environment and Business at (202) 833-6556, or call The Dryden Press at (800) 782-4479.

Getting in Step: Engaging and Involving Stakeholders in Your Watershed

This guide provides the tools needed to effectively engage stakeholders to restore and maintain healthy watersheds through community support and cooperative action. Available online at www.epa.gov/owow/watershed/outreach/documents.

Getting The Word Out in the Fight to Save the Earth

This book includes hundreds of practical and proven examples of how to effectively communicate your environmental message. It explains how any nonprofit group can expand and activate its membership, influence government officials, mobilize the news media, and shape public policy in the fight to save communities, regional ecosystems, and the earth. Available through the Johns Hopkins University Press, Baltimore, MD 21218.

How to Create a Storm Water Pollution Prevention Campaign

This manual is for neighborhoods, community groups, governments, and others that want to protect and improve water quality. It was produced by the Environmental Health Coalition, which has created many community-based programs that have served as models throughout the country. For more information, contact Environmental Health Coalition, 1717 Kettner, Suite 100, San Diego, CA 92101, (619) 235-0281.

How to Save a River: A Handbook for Citizen Action

This handbook presents the wisdom gained from years of river protection campaigns across the United States. It covers the general principles of action, including getting organized, planning a campaign, building public support, and putting a plan into action. Contact River Network at (800) 423-6747 or www.rivernetwork.org.

Know Your Watershed: Watershed Management Starter Kit

Want to start a watershed management partnership for your local watershed? This complete kit includes five guides (*Getting to Know Your Watershed*, *Building Local Partnerships*, *Putting Together a Watershed Management Plan*, *Managing Conflict*, and *Leading and Communicating*), a 13-minute video (*Partnerships for Watersheds*), 10 companion brochures, and an application to the National Watershed Network. In other words, it includes everything you need to get started. It's available from Conservation Technology Information Center, (765) 494-9555 or www.ctic.purdue.edu/Catalog/WatershedManagement.html.

Leadership Identification Guidebook

Leadership is an important part of any successful conservation partnership. This guidebook provides methods for identifying community leaders and tells how to involve them in promoting the goals of the conservation partnership. It will also introduce you to the concept of group dynamics and teach you facilitation skills that will enable you to get the most out of your meetings. The guidebook is available through the NACD Service Center, PO Box 855, League City, TX, 77574-0855, (800) 825-5547.

Making Waves: How to Put On a Water Festival

This publication is a great help in providing direction and ideas for organizing your own festival. Use *Making Waves* to plan an event in your school, county, or state. The water festival concept has been an enormously successful way to educate children and adults about water and water-related resources. This new version includes updated samples of fundraising letters, forms, news releases, and more. Also check out *Making More Waves: Ideas from Across the U.S. and Canada for Organizing Your Festival* and *Making a Bigger Splash: A Collection of Water Education and Festival Activities*. All are available through the Groundwater Foundation at (800) 858-4844. (Cost: \$12 each)

Pennsylvania Department of Transportation—Public Involvement Handbook

Community participation, enhancing the public's trust, managing conflict that might arise, and developing and carrying out a public involvement program are some of the subjects in this handbook. Also included is a section of ideas and techniques that can be applied to a variety of situations. Developed in 1995, the handbook is available through the Pennsylvania Department of Transportation, Harrisburg, PA. For more information, visit www.mccormicktaylor.com/training_proj_PIH.htm.

River Talk! Communicating a Watershed Message

River Talk! is a hands-on guide for people who want to be more efficient and effective in encouraging key sectors of their communities to become involved in designing river messages that resonate with target audiences. Contact River Network at (800) 423-6747 or www.rivernetwork.org.

Starting Up: A Handbook for New River and Watershed Organizations

This guide provides information for groups on how to get organized, including funding and procedural advice. Contact River Network at (800) 423-6747 or www.rivernetwork.org. (Cost: \$40)

Watershed Restoration: A Guide for Citizen Involvement in California

Some of the best science and technical tools available to citizens involved in coastal watershed management are available in this guide. Although it was developed for California, this well-constructed guide might spark ideas for use in other watersheds. Published in December 1995, it can be obtained by contacting the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Coastal Oceans Office, 1315 East West Highway, Silver Spring, MD 20910. Phone: (301) 713-3338; Fax: (301) 713-4044.

Watershed Toolshed

The Ohio Watershed Network, a statewide information and education network in support of local watershed protection efforts, maintains an online Watershed Toolshed which includes the module "Planning a Watershed Education Program." The module provides guidance to anyone interested in developing a watershed education program targeting specific audiences to help them make informed decisions to protect water quality. The Network also provides a listing of watershed groups in Ohio, the Ohio Watershed Academy, and other resources and references. Available online at <http://ohiowatersheds.osu.edu/index.html>.

Existing outreach programs

For the Sake of the Salmon (4SOS)

4SOS is a regional organization operating in Washington, Oregon, and California whose mission is “to restore salmon to levels which ensure healthy, sustainable natural populations and support productive fisheries.” 4SOS supports multi-stakeholder efforts to raise awareness and build consensus. Resources for communication, working with the media, and outreach can be found at www.4sos.org/wssupport/group_support/message.asp.

Maine Department of Environmental Protection’s Nonpoint Source Awareness Campaign

Maine’s Nonpoint Source Awareness Campaign started in 1995 as a collaborative effort between the Maine Department of Environmental Protection (DEP) and the State Planning Office to raise awareness about nonpoint source pollution prevention. Together these agencies produced the “8 Simple Steps” campaign and a series of radio and print messages. In 2000 the agencies began to develop more tailored materials and campaigns for their specific program needs. For more information, contact Kathy M. Hoppe, Maine DEP, 1235 Central Drive, Presque Isle, ME 04769. Phone: (207) 764-0477; e-mail: kathy.m.hoppe@state.me.us; Internet: www.state.me.us/dep/blwq/docwatershed/npscamp.htm.

Project NEMO

NEMO uses geographic information system (GIS) technology to educate landowners and municipal officials about nonpoint source pollution and watershed protection. Contact Chester Arnold, University of Connecticut Cooperative Extension, Haddam, CT. Phone: (860) 345-4511; Internet: nemo.uconn.edu.

RiverSmart

RiverSmart is a national public education campaign designed to show people how simple changes in their everyday activities can protect America’s water resources. RiverSmart is a project of River Network, the nation’s leader in supporting more than 4,000 local river and watershed groups nationwide that are working to save rivers. River Network Partner groups are placing RiverSmart television, radio, and newspaper ads in media outlets across the country. For more information, visit www.riversmart.com.

Think Blue San Diego

The City of San Diego believes the key to cleaner ocean waters is public education. That’s why they created the “Think Blue” educational campaign. “Think Blue” educates residents, businesses, and industries about the causes of storm-water pollution and the pollution prevention behaviors everyone can adopt. For more information, visit www.thinkbluesd.org.

Social marketing

Fostering Sustainable Behavior

Doug McKenzie-Mohr and William Smith developed this 175-page book on environmental marketing in 1999. The book is a compilation of the strategies and methods that collectively form the basis of community-based social marketing—a proven breakthrough in the field of environmental education and outreach. It was written for those involved in designing, implementing, and evaluating public education programs with the goal of promoting sustainable behavior. For more information, visit www.cbsm.com.

Developing a Communications Plan: A Roadmap to Success

This guide provides a roadmap for developing a communications plan. Readers can learn valuable processes, such as prioritization exercises and feasibility screens, as well as how to manage the challenges of building an effective consumer education plan from the ground up. Available from the Huron River Watershed Council (HRWC), 1100 North Main Street, Suite 210, Ann Arbor, MI 48104. Phone: (313) 769-5123; Fax: (313) 998-0163.

Hands-on Social Marketing: A Step-by-Step Guide

Written by Nedra Kline Wienrich, this guide explains the concepts behind social marketing theory and provides handy case studies and other resources. Contact Sage Publications by e-mail at order@sagepub.com or visit www.socialmarketing.com.

Strategic Marketing for Nonprofit Organizations

This book, written by Philip Kotler and Alan R. Andreason, forms a conceptual and practical foundation for marketing in nonprofit organizations. Its coverage encompasses the entire marketing process, providing valuable insights on strategic evaluations, positioning, market targeting, and more. For more information, visit <http://vig.prenhall.com>.

Listservers

NPSINFO

NPSINFO is a forum for open discussion of nonpoint source pollution issues. It is sponsored by the U.S. Environmental Protection Agency's Office of Wetlands, Oceans, and Watersheds. Possible topics for discussion include agricultural nonpoint sources, urban runoff, technology, educational and funding alternatives, coastal nonpoint sources, forest management, best management practices, hydrological modification, and aquatic habitat modification. NPSINFO welcomes news articles, short abstracts, announcements, and conference notices, as well as questions, answers, and opinions. For more information, visit www.epa.gov/nps/changes.html. To subscribe, send an e-mail to join-npsinfo@lists.epa.gov. Leave the subject line and message body blank.

Volunteer Monitor

The Volunteer Monitor listserver is a national forum for volunteer monitors. EPA established the list to encourage communication and information exchange among the nation's growing number of volunteer environmental monitoring

programs. You'll receive news on coming conferences, workshops, special events, and new publications. This site is also a discussion forum and networking tool that volunteer monitors of all types use to ask and respond to questions about volunteer monitoring methods, data quality, data management issues, and more. Whether your group monitors wetlands, streams, or lakes, sign up and get into the loop. To subscribe, send an e-mail to join-volmonitor@lists.epa.gov. Leave the subject line and message body blank.

Outreach materials

Around the Home and On the Road

This 32-page publication is full of useful tips on pesticides, household chemicals, erosion, water conservation, and more. The guide is intended to educate people about their role in the Chesapeake Bay ecosystem, but it's also useful beyond the coast. Copies are available from Alliance for the Chesapeake Bay, 6600 York Road, Suite 100, Baltimore, MD 21212. Phone: (410) 377-6270; Internet: www.acb-online.org.

Chesapeake Bay Community Action Guide: A Step-by-Step Guide to Improving the Environment in Your Neighborhood

This guide includes information on storm drain stenciling, stream cleanups, reforestation and tree care, and more. Contact Metropolitan Washington Council of Governments at (202) 962-3256 or visit www.mwcog.org.

A Citizen's Handbook to Address Contaminated Coal Mine Drainage

EPA developed this guide to familiarize citizens and grassroots groups with the history and chemistry of coal mine drainage (CMD) from abandoned mines. It provides an overview of the step-by-step process of contaminated CMD cleanup and the role that citizens and grassroots groups can play in that process. Ask for publication number EPA 903-K-97-003. EPA documents are available from the National Service Center for Environmental Publications, P.O. Box 42419, Cincinnati, OH 45242-0419. Phone: (800) 490-9198; e-mail: ncepimal@one.net; Internet: www.epa.gov/ncepihom.

The Clean Water Act: An Owner's Manual

This small booklet explains crucial sections of the Clean Water Act, points out how to get involved in regulatory decisions, and tells the stories of others who have done so. Contact River Network at (800) 423-6747 or www.rivernetwork.org.

Clean Water in Your Watershed: A Citizens Guide to Watershed Protection

Using Enviroscope watershed education models, children and adults learn by applying chemicals (drink mix) and loose soil (cocoa) throughout a typical community and then making it "rain" to immediately see the water pollution these activities could cause. Contact Enviroscope, c/o JT&A, Inc., 14524-F Lee Road, Chantilly, VA 20151. Phone: (703) 631-8810; e-mail: learn@enviroscapes.com.

The National Watershed Library

The National Watershed Library lists many education and outreach tools for specific audiences like farmers, homeowners, and teachers. Visit www.ctic.purdue.edu for more information.

Nonpoint Source News-Notes

EPA's *Nonpoint Source News-Notes* is an occasional bulletin dealing with the condition of the water-related environment. To download the newsletter and search back issues, visit the Web site at www.epa.gov/owow/info/NewsNotes.

Surf Your Watershed

Through this online service, you can locate your watershed and discover its condition and the partnerships working to protect it. Find information on population, area, land use, environmental issues, watershed groups, and water quality. You can also generate maps of your watershed at www.epa.gov/surf.

Volunteer Monitor

The *Volunteer Monitor* newsletter facilitates the exchange of ideas, monitoring methods, and practical advice among volunteer environmental monitoring groups across the United States. Available at www.epa.gov/owow/monitoring/volunteer/vm_index.html.

Water Environment Web

This Web site provides a collection of Water Environment Federation resources and outside links related to watersheds. Included are publications, background information, coming events, and networking areas. www.wef.org/WaterNews.

Watershed Academy Web

Through the Watershed Academy Web, EPA offers a variety of self-paced training modules that represent a basic and broad introduction to the watershed management field. Modules take ½ hour to 2 hours to complete. Courses include Top Ten Watershed Lessons Learned, Introduction to the Clean Water Act, Wetland Functions and Values, and more. For more information, visit www.epa.gov/watertrain.

A Watershed Approach to Urban Runoff: Handbook for Decisionmakers

This handbook outlines a process for understanding your watershed; explains the watershed management approach to assessing, planning, implementing, and evaluating; gives an overview of assessment and management tools; and provides detailed insights into structural and nonstructural best management practices and sample site plans. The guide can be obtained through the Conservation Technology Information Center at www.ctic.purdue.edu.

Watershed Protection: Catalog of Federal Funding Programs

The *Catalog of Federal Funding Sources for Watershed Protection* is now online as an easy-to-use, searchable Web site. The site provides information for watershed practitioners and others on 84 federal funding sources that may be available to help fund various watershed-related projects. The site updates EPA's original *Catalog of Federal Funding Sources for Watershed Protection* (EPA 841-B-99-003), which was previously published in 1999. For more information, visit www.epa.gov/watershedfunding.

Watershed Stewards Project

This community-based watershed restoration program is committed to restoring salmon and other life-forms that depend on healthy watersheds for survival. Members join with top resource professionals, forming cooperative relationships

between private industry, government agencies, and academic institutions, to build public awareness of the importance of watershed stewardship. For more information, check out the project's Web site at www.northcoast.com/~fishhelp.

Working with the media

Communications Tips for Positive Media Relations

The following Web site, hosted by the Mississippi Department of Education's Office of Information and Safety, provides a list of helpful suggestions for organizations working with the media for outreach purposes: www.mde.k12.ms.us/extrel/network/nettip.htm.

Culvert Action: How to Interest Your Local Media in Polluted Runoff Issues

This manual is intended to provide assistance to anyone seeking to educate the public about polluted runoff through newspapers, radio, and television. It's available from the Lindsay Museum, 1931 First Avenue, Walnut Creek, CA 94596. Phone: (510) 935-1978.

The Green Room: Media Writing for Environmentalists

The *Green Room* will show you how to get media coverage, how to implement a media campaign, and the importance of the campaign. The site will take you through each step from drafting press releases and hosting media events to developing a long-term communications strategy. Visit www.green-room.org for more information.

Media Facts: A Guide to Competitive Media

Published by the Radio Advertising Bureau, this guide will help you understand and evaluate the strengths of various media formats. To download a copy, visit www.rab.com or call 1-800-252-RADIO.

Media Relations Guidebook

This guidebook provides tips to help you make effective use of the media in your area to promote watershed protection. It outlines the process of writing news releases and announcements. The guidebook is available through the NACD Service Center, P.O. Box 855, League City, TX, 77574-0855. Phone: (800) 825-5547.

Press Release Writing

The Press Release Writing Web site provides several articles and tips for organizations beginning to write PSAs. Visit www.press-release-writing.com for more information.

Public Service Advertising Research Center

The Public Service Advertising Research Center is an online information library dedicated to public service advertising. The site provides a PSA bibliography, media profiles, an interactive broadcasters' café, case studies, and help sites. Visit www.psaresearch.com for more information.

Radio Marketing Guide and Fact Book for Advertisers, 2002–2003 Edition

Use this guide from the Radio Advertising Bureau to determine how radio can help you attain your outreach goals and market your cause more effectively. To download a copy, visit www.rab.com or call 1-800-252-RADIO.

Appendix E. Marketing definitions, process, techniques, and research:

A succinct guide that will be useful for developing marketing strategies is “Marketing for Conservation Success Guidebook” put out by the Natural Resources Conservation Service (NRCS). This document is attached.

For more in-depth marketing aspects, probably the most comprehensive watershed marketing guide is “Getting Your Feet Wet With Social Marketing”, by Jack Wilber <http://ag.utah.gov/divisions/conservation/documents/GettingYourFeetWet.pdf>

Below is a list of some further information and resources that you might find helpful.

Marketing definitions:

American Marketing Association (AMA):

Marketing is the process of planning and executing the conception, pricing, promotion, and distribution of ideas, goods, and services to create exchanges that satisfy individuals and organization goals.

Social Marketing Behavior:

Social marketing represents a unique system for understanding who people are, what they desire, and then organizing the creation, delivery, and communication of products, services, and messages to meet their desires while at the same time meeting the needs of society and solving social problems (Smith and Strand, 2008).

Wildlife and The American Mind:

Within the context of fish and wildlife management, **marketing** is the deliberate and orderly step-by-step process of first defining what it is – exactly – that is trying to be achieved; understanding and defining different groups of constituents (markets) through research; and then tailoring programs, products and services to meet those needs through the manipulation of the marketing mix – product, price, placement, and promotion (Duda, Bissell, and Young, 1998).

Market Research and Resources:

Market research provides the team with a greater understanding and insights about the potential target audience(s). It is necessary to investigate and understand the human dimension (history, culture, beliefs/values, attitudes, behaviors, economics, politics, etc.) and demographics (land ownership, age, sex, income, education, etc.) of that place.

1. Who lives in the watershed?
2. How do residents earn their livelihoods?
3. How do residents use and impact the natural resources of the watershed?
4. How do the conditions of the natural resources impact residents?

5. What vision do residents have for the watershed? What is important to residents?
6. What are the residents' opinions about the proposed watershed management plan?

Items 1 – 6 can be found in, *Step-by-Step Guide to Conducting a Social Profile for Watershed Planning*. For more information about conducting a social profile, please see the following link:

<http://www.watershedplanning.illinois.edu/index.html>

Resources:

Missouri has a broad diversity of landscapes and people. Providing an exhaustive list of how and where to collect market research is impractical; however, the following references should give the reader some ideas that could be helpful in a conservation marketing planning process.

MDC Staff:

- MDC has a Human Dimensions Working Group (HDWG) composed of specialists from within and outside of MDC (please see list below). The HDWG is knowledgeable about existing fish, forest, and wildlife secondary market research and market research methodology.
 - Tom Kulowiec
 - Ron Reitz
 - Heather Scroggins
 - David Thorne
 - Tom Treiman

MDC Secondary Market Research:

- <http://mdcsharepoint/sites/resource/science/Documents/Forms/RS.aspx?RootFolder=%2fsites%2fresource/science%2fDocuments%2fHuman%20Dimensions&FolderCTID=%26395d7d05%7d>
MDC sharepoint provides existing fish, forest, and wildlife market research.

Textbook:

- Decker, D. J., T. L. Brown, and W. F. Siemer. 2001. Human Dimensions of Wildlife Management in North America. The Wildlife Society, Bethesda, MD. 447 pp.

Online Resources:

- <http://cares.missouri.edu/>
CARES integrates the social, physical, and biological sciences to better understand human, natural resource, and environmental issues and problems. The site is useful to assist with basic resource inventories and demographics down to the 14 digit hydrologic unit.
- <http://www.ssi.nrcs.usda.gov/index.html>

The website is described as, "Social Sciences -Linking people and conservation." The site provides social and economic farm data at the county level. It also includes marketing and environmental psychology tools.

- <http://www.hd.gov/HDdotGov/>
HumanDimensions.gov, or HD.gov for short, is an interactive informational website and a portal with featured links related to the human dimensions of natural resource management. HD.gov guides users to credible on-line information, including methods, on-line tools, publications, and a calendar of events.
- <http://www.csc.noaa.gov/surveydesign/wheel.html>
Human Dimensions "Wheel" - The double-sided wheel provides basic information about coastal management issues and the social science tools used to address these issues. The tools include focus groups, surveys, content analysis, and cost-benefit analysis.
- <http://www.csc.noaa.gov/socialscience/stics.html>
Using socioeconomic data can help coastal and resource managers gain a better understanding of geographic trends in human behavior, learn the relationship between humans and the environment, and help make more informed decisions.
- http://factfinder.census.gov/home/saff/main.html?_lang=en
American fact finder provides census data (population, economics, age, sex, education, etc.). Facts can be queried by country, state, county, town/city, or zip code.
- <http://mcdc2.missouri.edu/>
Provides Missouri census data.
- Additional market research and social marketing concepts can be found on the Internet. Identifying the potential target audience(s), issue(s), or habitat(s) is critical to avoid information overload. For example, if you want to know learn more about Missourians' attitudes towards water quality, search for, "Missouri water quality + human dimensions".

MARKETING FOR CONSERVATION SUCCESS

AN EASY-TO-USE-WORKBOOK FOR MARKETING CONSERVATION SERVICES

PRODUCED BY

NATIONAL ASSOCIATION OF CONSERVATION DISTRICTS

**IN COOPERATION WITH
NATIONAL ASSOCIATION OF STATE CONSERVATION AGENCIES
USDA NATURAL RESOURCES CONSERVATION SERVICE**

1994

All programs and services of these groups are offered on a non-discriminatory basis without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

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INTRODUCTION TO MARKETING

More than ever, our communities, state leaders and national leaders look to the partnership of conservation districts, state conservation agencies and the Natural Resources Conservation Service for help. They understand that our technology and conservation programs offer practical, proven solutions for resolving environmental issues in today's dynamic world.

But today's world of tight budgets and a wider diversity of people who are interested in our work, requires more creativity in how we work with people—our customers—to meet their needs.

The benefits of our technology and programs, and how they help solve environmental issues, must be stressed in different ways with many types of customers—agricultural, environmental, legislative, business and others who can benefit by working with us.

This *Easy-to-Use Workbook for Marketing Conservation Services* will help the conservation partnership meet customer needs through "marketing."

OBJECTIVES OF THIS WORKBOOK

The purpose of this workbook is to provide the members of the conservation partnership at the local level with the tools needed to:

1. Understand and use the marketing process
2. Develop or improve marketing skills and techniques through case study examples
3. Develop marketing plans for promoting our technology and conservation programs to help solve environmental issues

The real-life case study examples from conservation partnerships throughout the U.S. in this workbook will help local conservation district officials and employees, state conservation agency employees, state conservation district association leaders and employees from the Natural Resources Conservation Service (NRCS) at all levels. Other partners can also benefit from this workbook.

WHAT IS MARKETING?

Mention the word "marketing" and some people immediately see smooth-talking salesmen in plaid sport coats persuading customers to buy a used car with slick high-pressure pitches.

Many others think of marketing as a complicated and confusing mixture of mind reading and magic wand waving to come up with an arbitrary plan of action.

Marketing, however, has nothing to do with these old cliché images. Marketing is NOT forcing unwanted products on wary customers. *Instead, marketing involves asking customers what they need and providing products or services which meet those needs.*

Marketing doesn't have to be a complicated procedure. *Marketing is a straightforward step-by-step process which anyone can learn and use.*

HOW CAN MARKETING CONSERVATION HELP THE PARTNERSHIP?

Marketing will help us:

- Meet customer needs
- Strengthen the capacity of the conservation district, state conservation agency, and NRCS partnership at the local level
- Expand our conservation partnership to be more effective by forming alliances with groups who share our issues
- Anticipate and address conservation issues at the local, state and national level
- Deliver the right service to the right customer
- Increase public support

The sample worksheets with case study examples will guide you through a seven-phase process to develop an effective marketing plan. The blank worksheets in Appendix B are for you to photocopy and use as you develop your own plan.

A thought: Marketing is a team effort. To get everyone involved, consider having a different member of the team lead each phase.

PHASE 1– IDENTIFY CRITICAL ISSUES

Conservation programs developed in the past may not address all of the environmental issues your partnership deals with today. Therefore, determining your critical issues is the first step in effective marketing.

This phase of marketing will help you identify critical issues for your partnership and how you might respond to them.

WHAT IS AN ISSUE?

A conservation issue is any topic related to the conservation of natural resources that can affect land users or other customers of the partnership. The variety of customers your partnership serves will be specifically identified in Phase 3, so for now consider customers in a broad sense.

The issues your office deals with may likely relate to:

- A community issue such as how to improve water quality in a watershed.
- The partnership's voice on national/state/county issues relating to natural resource

conservation, such as addressing the issue of voluntary versus mandatory conservation.

- A Food and Agricultural Council's goal or priority, such as providing convenient one-stop shopping for farmers and ranchers.
- Pending national legislation that affects your customers, such as the rewrite of the Endangered Species Act.

Examples of possible responses may include:

- Educating interest groups concerned about water quality and securing their commitment to support your position on the issue.
- Bringing together agricultural, business and environmental groups to demonstrate the success of voluntary conservation programs.
- Focusing public attention on developing a proactive ecosystem management plan that restores a critical species through managing natural resources rather than eliminating the use of natural resources.

PRIORITIZE AND FOCUS ON ISSUES

Time and resources may not allow you to address all the critical issues you identify. Prioritize them. Select the most important issue first and develop a marketing plan focused on it. Then apply this same marketing process to your other priority issues.


TASK

Stop now and review the case study in Sample Worksheet 1. This case study illustrates the steps used to create a working list of the critical issues and possible responses to those issues. It features the activities of the Clallam County Conservation District of Puget Sound in Washington state and its efforts to improve water quality and habitat for fish.

SAMPLE WORKSHEET 1

CRITICAL ISSUES—CASE STUDY

1. Select the most critical ongoing or emerging conservation issues in your community that you want to address.

<u>Issue:</u>	<u>We need to:</u>
 Improve the quality of water entering Sequim Bay to:	
1. Return production of oysters and clams in the bay to historic levels; and	1. Decrease the amount of fecal coliform entering Sequim Bay from agricultural waste and failing septic systems.
2. Improve habitat in rivers so that coho salmon production in the watershed returns to historic levels.	2. Provide spawning habitat for coho salmon by: <ul style="list-style-type: none">• Creating deep pools and riffles• Changing straightened streams to meandering streams• Planting vegetation in riparian (streamside) areas• Developing alternative livestock water to reduce riparian grazing

<u>Issue:</u>	<u>We need to:</u>
Logging small parcels of privately-owned land with improper techniques due to rapidly rising timber prices, putting harvest pressure on small acreages and causing accelerated soil erosion.	Find alliance members that will add to our expertise, and help us work with timber owners and loggers to promote use of proper harvest techniques.

<u>Issue:</u>	<u>We need to:</u>
Excessive irrigation on cropland causing deep percolation of agrichemicals and fertilizer, creating elevated nitrate levels in groundwater.	Work with producers to reduce water usage through proper application tied to crop needs.

2. Check your highest priority issue, or combine related issues into a single issue, for which you will develop a marketing plan.

PHASE 2– DEVELOP ALLIANCES AND DETERMINE YOUR ROLE

This phase identifies other organizations that might also be involved with your critical issues and willing to contribute resources. It also helps you define your role in working with other groups.

- State fish and game wanting to improve fisheries
- Livestock groups representing ranchers and their efforts to be economically sustainable and environmentally responsible

ADD TO THE PARTNERSHIP – DEVELOP ALLIANCES

The partnership of conservation districts, state conservation agencies and the Natural Resources Conservation Service can benefit by forming alliances with other groups to tackle a common issue. For example, if the issue is water quality, these may be good groups with which to form an alliance:

- Trout Unlimited or the Sierra Club involved in streamside improvements on grazing lands
- A sustainable farming group interested in legume crops

GET INPUT FROM MANY GROUPS

The more ideas generated the better the chance for success, so include as many groups as reasonable and productive in an alliance. Share with them your response to the critical issue. What is their reaction?

INVOLVE INTEREST GROUPS

Special interest groups are a fact of life. Many groups exercise influence to accomplish their goals. Working together may help you both accomplish common goals.

TIPS FOR DEVELOPING AN EFFECTIVE ALLIANCE

- Talk with community opinion leaders and get them involved.
- Find out their views about your issues.
- Talk to community groups which have political influence. Learn their “hot buttons” and positions on key issues.
- Create a list of key contacts. This list may include organization leaders, media personnel, etc.

BUILD RELATIONSHIPS

In order to work effectively with the groups in your alliance you must be able to see the issue from their vantage point, and to describe benefits from their perspective.

How can you do this? When possible, work with groups on their issues, and support their projects. This requires an investment of time, but can yield large profits in the form of mutual understanding and cooperation.

It's important to know how the critical issues affect a potential alliance member in order to determine if they should be involved with you on an issue. Every member should have a stake in the outcome.

SHARE RESOURCES

New partners can promote your common goals, and also allow you to pool resources, which benefits everyone involved.

Think of community organizations, individuals or other groups that can contribute resources to resolving your issues. Resources can range from providing meeting space, to producing a video or publication, to providing funding for projects.

DETERMINE YOUR ROLE IN THE ALLIANCE

After identifying new alliance members, it's important to determine your role in this expanded effort to deal with your issue. This step will guide you in writing a role statement. It may be a good idea to have each of your alliance members write a role statement for this issue, too.

WRITING A ROLE STATEMENT

A role statement is a type of mission statement specific to your issue. It explains your purpose, and defines who you are and what you will do regarding this issue. Your role statement should make it easy for people to quickly grasp what unique conservation role you play.

When writing a role statement, be sure to:

- Be realistic—Consider your resources and capabilities. You want to ensure success, so keep your limitations in mind.
- Be specific—Keep role statements concise and explicit.

A good role statement should:

- Be short and to the point
- Use everyday language (no jargon or technical terms)
- Portray the character of your organization
- Use action verbs

Following is an example of a role statement:

“We provide farmers with access to voluntary, affordable technology which can help them improve water quality.”

TASK

Review Sample Worksheet 2. In this case study, agricultural producers in the watershed from which New York City draws its drinking water embarked on a bold new effort to reduce water pollution. Producers faced difficult choices. Strict regulations developed by the city and EPA; having the city buy farms and take them out of production; or forming an alliance with the city, environmental groups and many others concerned about the watershed to develop a voluntary approach to solving the problem.

The latter option was chosen. With conservation district leadership, 22 farm groups formed the Watershed Ag Council and began identifying other groups to join this alliance. The sample worksheet shows just a few of the potential alliance members.

**TIPS FOR ESTABLISHING
YOUR ROLE**

- Be inclusive. The entire staff, board and volunteers should be able to communicate about your role statement and what it means to the conservation partnership.
- Refer to the role statement over and over again. It's a good tool for communicating clear and consistent messages to your customers.
- Be visible. Get involved and stay active in professional networks, clubs and trade associations in your field. Tell these peers about your important conservation role.
- Know the issues and take a stand. You are a leader and an authority in your area on conservation. Be out front.
- Deliver what you promise. Consistent and reliable delivery of your conservation partnership's services is the most crucial part in establishing your role.

SAMPLE WORKSHEET 2

FORM AN ALLIANCE/IDENTIFY YOUR ROLE—CASE STUDY

1. For the issue you circled in Worksheet 1, list other groups in your community who are also addressing this issue. What can this group provide? How will this group benefit from cooperating with us?

<u>Group</u>	<u>What they can provide</u>	<u>How alliance benefits them</u>
NYC Department of Environmental Protection	Funding & political clout for rural issues	Watershed protected—avoid having to purchase ag land
Natural Resources Conservation Service	Technical knowledge, assistance and a close working relationship with farming community	Fulfillment of mission
Upstate/Downstate Partnership	Coordination of diverse interested parties and access to their many members	Their issues and concerns will be addressed in the development of the Whole Farm Program
Watershed Ag Council	Consists of 22 farmer/agribusiness watershed leaders who can make the program work	Preserve rural way of life for agriculture and farm businesses and economic survival

2. For the issue you selected, complete the following phrases in as many ways as you can think:

a. ~~We're the people who... can bring together ag groups, technical agencies and others to form an alliance for developing a voluntary Whole Farm Program funded by the City of New York that will protect water quality, provide viability for agriculture, and prevent stringent regulations imposed by the Federal Safe Drinking Water Act.~~

b. No one, but no one, can _____ as well as we do. ...support a voluntary, locally-controlled program to protect water quality and economic viability of agriculture in the New York City Watershed by getting 85 percent of the farmers living in the watershed signed up to develop a Whole Farm Program plan and implement best management practices to protect water quality.

c. We want to be seen as... a national model for developing an interagency alliance approach to protect water quality and agriculture in watersheds through a voluntary incentive-based program.

3. Now go back and circle the phrases that most strongly convey who you are and what unique role you want to play.

4. Based on the circled phrases in #2 above, and applying the four criteria for good role statements (short and to the point, use everyday language, convey character, and use action verbs), write your role statement here: We are the ones to encourage farmer participation in an interagency, voluntary Whole Farm Program with financial incentives to protect water quality and the economic viability of agriculture in the New York City Watershed, which will be seen as a national role model.

5. Test this with alliance members. Revise statement if necessary. This statement will change over time as you learn more about your alliance, customer needs or as the issue changes.

PHASE 3 – DEFINE CUSTOMERS

After identifying the critical issues, finding new partners, and determining your role in the expanded partnership, it's time to zero in on the customers who may use the services you and members of your alliance provide. Phase 3 will help you do this.

WHO ARE OUR CUSTOMERS?

A customer is any individual or group that can benefit from the services your partnership has to offer.

You may be asking, “Are they a customer or a partner?” The distinction between the two is not always clear, but if their participation results primarily in benefiting from the services of the partnership, consider them a customer.

You may tend to lump customers into categories—farmers, ranchers, environmental group members, etc. But a good marketing plan gets even more specific about customers. For a watershed where water quality is a priority issue, you may have these customers:

- Dryland small-grain farmers
- Irrigated beet growers
- Sustainable farmers using legume crops in cereal grain rotations
- Landowners with small acreages used primarily for grazing horses
- Wool producers
- Homeowners who install septic systems close to creeks
- The local Audubon chapter concerned about habitat enhancement
- A local native plant group wanting to establish natural areas
- Communities who store their water in reservoirs

Specific methods of customer “information gathering” will be covered in Phase 4 of this text, “Identify Customer Needs.”

For now, just concentrate on how background information can help you to understand and work with your customers.

TASK

Each of these customers has different needs. Talking with each is important. Remember that marketing *encourages us to talk with others outside the partnership—especially customers.*

Stop and review the case study in Sample Worksheet 3. It shows that some conservation districts have unique issues. Such is the case of the Santa Cruz County Resource Conservation District and its urban environment. There, improper road building techniques in mountainous, geologically unstable areas can cause fatal landslides and encourage the spread of wildfires.

SAMPLE WORKSHEET 3

CATEGORIES OF CUSTOMERS—CASE STUDY

1. Make a complete list of your customers for the issue you have selected.

<u>Who</u>	<u>What we want them to do for this issue</u>	<u>Benefit to them</u>
Landowners -Homeowners -Renters -Road & homeowner associations	Use technically sound road stabilization practices and revegetation techniques to prevent erosion, landslides, spread of wildfire, poor water quality and, in extreme cases, fatalities due to fire and landslides.	Creates safe environment, enhances property value, provides peace of mind.
County Planning & Public Works Dept.	Adopt our sound technical standards for revegetating road cuts as well as other erosion sediment control practices.	Assurance that they are using technically proven conservation practices that are research based.
Local water & fire districts/ California Department of Forestry	Encourage use of fire retardant and drought-tolerant vegetation near and around homes.	Greater chance that homes will not suffer damage in wildfires. Conservation of limited water supplies.
Private contractors that do road related work & suppliers of erosion control products and services.	Use technically sound erosion control techniques.	Provides homeowner or road association the best information and service.

PHASE 4 – IDENTIFY CUSTOMER NEEDS

In this phase, customers tell you about their needs concerning the issue. They provide information that will allow you to test your response to the issue, if you have the right members in the alliance, if your role statement is on target, and what service you need to provide.

GOOD SERVICE MEANS MEETING CUSTOMER NEEDS

Marketing isn't just for selling products in the business and manufacturing industries anymore. It's a way of providing service based on customer requirements.

For each issue, you need to ask customers:

- What do they need to deal with this issue?
- Do we have a service that addresses their need?
-

If we do have this service, why aren't they using it as we want them to?

- How can we make this service more accessible and convenient for them?
- How can we make them more aware of this service?

Table 4 on the next page gives you methods for obtaining answers to your questions.

REVISIT PARTNERS

After gathering information from customers and identifying their needs, ask yourselves and your partners these questions.

- Do we have services that address customer needs?

- Do others have these services? If so, are they willing to form an alliance to serve mutual customers?
- Does our conservation district/state conservation agency/NRCS partnership need to develop these services? Should the alliance develop these services? How can we gather enough resources to provide this service?
- Is the possible response we wrote for this issue in Phase 1 still on target? Do we need to revise it to reflect customer needs?

TABLE 4

INFORMATION GATHERING METHODS	
Information Gathering Method	Explanation
<input type="checkbox"/> Personal Interviews	One-to-one interviews need to be conducted. A loose series of question are asked and listening skills are used.
<input type="checkbox"/> Focus Group	Assemble seven to nine people in small groups. A preset list of questions are asked. Quick method to explore attitudes and needs of people.
<input type="checkbox"/> Survey	Question a sample of people in order to generalize responses to a larger population. There are many different types of surveys.
<input type="checkbox"/> Personal Observations	You continually make observations. If you attempt to be unbiased during these observations, they can be a valid method of gathering information. Written notes are a way of documenting your observations.
<input type="checkbox"/> Direct Mail	NRCS's Field Office Computer System (FOCS) enables use of a customer data base to pinpoint targeted group. Enables you to: ask for a particular action from the person, establish a dialogue by asking for a response, and offer satisfaction of previously stated need.
<input type="checkbox"/> Printed Materials	Publications, library documents, census data, published data bases, personal accounts, journals, magazines, newspapers, etc. can all provide valuable information about your local area.
<input type="checkbox"/> Advisory Committee	Composed of three to six individuals who are knowledgeable members of the community. These committee members are likely to have a sense of community needs, attitudes, resources, and desired services.
<input type="checkbox"/> Key Informants	Interview community members individually who have exceptional knowledge of community needs, attitudes and resources. These interviews are not conducted with a formal list of questions. They are unstructured.

TASK

- How does our role statement in Phase 2 for this issue match our customers' expectations? How do we need to revise the role statement?
- If we have a service that meets customer needs, can the alliance help us expand or improve this service?
- Can the alliance help us make this service more accessible and convenient?
- Did our customers identify other possible partners for us?
- From what your customers told you, can you combine some customer groups?
- Do you need to split other customer groups into smaller segments?

Review the case study example in sample Worksheet 4. This example illustrates the steps used to identify customer needs.

The small rural town of Holly Grove, Arkansas, developed a community improvement plan to deal with flooding from a nearby creek. This flooding hinders economic development for the community, and many residents – especially younger ones – are moving away.

Residents and community leaders in Holly Grove met in a focus group setting with the conservation partnership to outline possible solutions to these two interconnected issues.

Spending the necessary time up-front to gather customer needs will pay off big in the long run by ensuring a project's success. This type of research is what separates a complete and successful marketing plan from a haphazardly thought-out and ineffective one!

SAMPLE WORKSHEET 4A

IDENTIFY CUSTOMER NEEDS—CASE STUDY

1. For your critical issue, use information gathering techniques to answer the following questions for each customer group identified in Worksheet 2. Complete this worksheet for *each* customer category.

Customer: Residents of Holly Grove who are concerned about regular flooding, and its impact on economic and social stability of their community.

What does your customer need to deal with this issue?

- Complete the Holly Grove Floodplain Management Study and implement it this year
- Promote leadership development
- Provide employment and business opportunities in the community
- Provide affordable housing that is safe from flooding
- Develop a niche for Holly Grove, such as a regional center for outdoor recreation

What services do you offer to help customers deal with this issue?

The conservation partnership can help develop a Floodplain Management Study and provide assistance from the Resource Conservation and Development Program to address economic stability.

Why are customers not using the service as much as you like? What can you do to make this service more convenient and accessible to meet customer needs?

People are taking an active role in their community's future, but they are hindered by unnecessary red tape and community out-migration due to lack of business and employment opportunities.

What services need to be developed to meet customer needs?

To promote leadership development, the partnership will help create a Holly Grove Community Development Committee to cultivate tourism and recreational interests, and assist in grant writing training to obtain funds for community development.

Where do customers get information about this issue and the service you or your partners provide?

Through six ad hoc committees established to meet goals.

What characteristics of customers (age, income, education, etc.) will affect how you provide services regarding this issue?

Younger people, upon completing their education, are leaving for better employment opportunities. As the community development activities progress and more economic, educational and social opportunities are improved or created, young people will stay or return to the community.

2. How will you get information about customer needs? Check all that apply.

- ☐ Existing information that you already have
- ☐ Existing information that your partners already have
- ☐ Printed information from previous studies, newspaper articles, etc.
- ☐ Gather information yourself with your partners through methods on Table 4
- ☐ Hire a consultant or use a volunteer who is a professional

SAMPLE WORKSHEET 4B

IDENTIFY ALLIANCE MEMBER NEEDS-CASE STUDY

For each customer group, visit your partners to get their perspective of customers needs and how they are dealing with them. Also visit any potentially new partners/customers suggested in Worksheet 4A.

Customer: Holly Grove residents

Alliance Member(s): Holly Grove Town Council & community leaders

How do we share this customer?

Our customer looks to these partners for leadership in addressing flooding and the economic stability of Holly Grove.

What does this alliance member(s) tell you the customer needs to deal with this issue?

The community leaders say customers want flooding controlled. Possible solutions they suggested are dredging of the upstream water bodies, or relocating houses to non-flood areas.

What service(s) does this alliance member(s) offer to help your customer with this issue?

The Town Council can provide leadership in pulling the community together to find consensus on how to solve flooding problem and how to promote economic growth. The Council can formally request funding from state and federal programs to address these issues.

For this issue, how can we work together to meet customer needs and achieve this alliance member(s) goals?

The flooding problem represents just one of a host of issues the community is attempting to solve. The conservation partnership can provide technical assistance.

Housing, employment, and business and youth out-migration, are all issues that a variety of public and private organizations need to collectively address. We can join the effort to promote economic stability by exploring the Resource Conservation and Development program. The Town council is interested in learning more about RC&D.

PHASE 5 – SET A STRATEGY AND ACTION GOALS

After you have gathered and analyzed information about customer needs for your issue, you are ready to identify a marketing strategy and set action goals.

Phase 5 explains how to:

- Develop a broad marketing strategy
- Set action goals that can be measured for what you want to accomplish
- Consider factors which might impact these goals
- Adjust the goals to account for these factors

WHAT IS A MARKETING STRATEGY?

A strategy is an approach you will use to satisfy customer needs. For example, if customers who own small parcels of land in suburban areas need assistance at times other than your normal office hours, a broad strategy might be to develop videos and other informational materials they can use at their own convenience, or make your service available during evenings and/or on weekends.

Another example might be a group of irrigating farmers who want to experiment with innovative irrigation technology, but are hesitant to do it on their own for fear of economic loss. A broad strategy might be forming a local support network for those willing to experiment with new practices with minimal risk.

WHAT ARE ACTION GOALS?

Action goals state what you want to achieve and how you will define success in your marketing program. To do this, write goals that are:

Specific:

The goal is expressed in explicit, detailed terms, not general ones.

Measurable:

The goal must be measured to determine the success of your marketing effort. There are many kinds of measurements.

Some examples are in the table on the next page.

EXAMPLES OF ACTION GOALS:

“To enlist and train 30 volunteers to help small acreage owners improve 3500 acres of pasture land.”

“To reduce irrigation water waste by 25% by the end of the year.”

Your action goals are linked to your critical issue and the needs of your customers—needs which you determined in Phase 4. You will likely have multiple goals as they relate to a critical issue and different types of customer who have different needs.

SETTING ACTION GOALS

■ Start by setting your sights high

Think about the best possible results, or the ideal success, to these items. This is your initial goal. (Don't worry if this goal seems unrealistic, we'll adjust later.)

■ Consider outside factors

Now consider the outside factors (both good and bad) which could affect your ability to reach this goal, and decide how you will adjust for these factors. Examples of outside factors might include the economy, pending legislation, high turnover of properties, trends, attitudes, etc.

■ Consider your own resources

Next take a look at the resources you have (budget, staff, partner resources, volunteer time, etc.). How do these limitations affect the best possible goal you identified above?

EXAMPLES OF MEASURES:

Following are some examples of each type of measure. To explain each measure, refer to our example goal of: "To enlist and train 30 volunteers to help small acreage owners improve 3500 acres of pastureland."

Physical: Physical measures refer to acres of land improved, acre-feet of water conserved, tons of soil saved, etc. In the above example, the physical measure is the 3500 acres which would be improved.

Psychological: Psychological measures refer to customer satisfaction. In the example, the psychological measure is the satisfaction of the landowners whose land is improved, and the conservation ethic instilled in those landowners.

Awareness: Measured by the increased awareness among people in the community about a resource problem or solution. In our example, the measure is the increased awareness in our 30 volunteers, and in the landowners who participated.

Participation: Measured by the level of participation in a partnership project. In the example, the participation could be measured by the 30 volunteers and the small acreage owners.

Adoption: Measured by how many people adopt a conservation practice. In this case, the measure is by the number of landowners who adopt the training practices to improve the pastureland.

TASK

■ Formulate a realistic goal

After considering outside factors and your limitations that might affect your ability to reach the initial goal, adjust for these and come up with a realistic goal. Include time frames for accomplishing this goal.

Review Sample Worksheet 5. The case study features the broad strategy and action goals of the Montana Farm and Ranch Improvement Club alliance. The alliance consists of conservation and agricultural agencies, agricultural groups, the state's sustainable farming organization, farm media and research institutions to promote conservation technology. This worksheet should be completed for each customer group for your issue.

SAMPLE WORKSHEET 5

ACTION GOALS—CASE STUDY

1. Customer:

Farmers/ranchers wanting to try new conservation technology at minimum financial risk

2. Based on the information you've gathered from customers and alliance members, what broad strategy will you use to address this critical issue based on customer needs?

Form a network of producers who are willing to try innovative conservation practices, and provide technical assistance and incentive funding to offset seed, equipment or other costs associated with trying new technology.

3. Considering factors that may work for or against you, what is the best possible goal you can achieve in addressing this issue?

Goal: Create a network of Farm and Ranch Improvement Clubs to test new innovative technology and provide a forum for members to support each other in their experimentation—at least one club per county.

By When: January 1996

Goal: Secure at least \$100,000 of funding from a private foundation to hire a Farm and Ranch Improvement Club Coordinator

By When: March 1993

Goal: Through promotion by clubs, increase by 200 percent the amount of legume crops being used as soil-building green fallow among Montana small-grain producers.

By When: March 1996

PHASE 6 – DEVELOP AND ACTIVATE THE MARKETING PLAN

In this phase, you develop your action-oriented marketing plan taking into account all of the information you've gathered from partners and customers in previous phases.

CONSTRUCT A MARKETING PLAN

A marketing plan is the blueprint. It identifies appropriate marketing actions you and your partners will take based on the needs of your customers, partnership resources, your broad marketing strategy and action goals.

Worksheet 6 is your blueprint for your marketing plan. You will need to complete this worksheet for each customer group that you identified for your critical issue. Keep in mind that partnerships may vary with each customer group. So might your strategy.

As you develop action items, ask yourself if these actions will satisfy customer needs? Will these actions help the partnership resolve your critical issue? Do these actions effectively use the resources of the partnership?

TASK

In the case study example on Worksheet 6, the Iowa conservation partnership expanded. The partnership enlisted the support of agribusiness and conservation producers to help other farmers apply conservation on highly erodible land.

TIPS FOR DEVELOPING A MARKETING PLAN

- Assign a marketing coordinator to oversee the plan.
- Include members of the alliance/coalition in the planning process (if appropriate).

SAMPLE WORKSHEET 6

DEVELOP THE MARKETING PLAN-CASE STUDY

Critical Issue: Accelerate protection of highly erodible land

Customer: Iowa producers of corn and soybeans who are farming highly erodible land

Customer Need(s): Consistent information and assistance about crop residue management from credible sources, especially ag supply dealers and conservation farmers

Identify Partners and Alliance Members: Iowa Association of Soil and Water Conservation Districts; Iowa Department of Agriculture and Land Stewardship; Extension; agribusiness representatives; farm organizations and commodity groups; conservation groups and farm media.

Broad strategy you will use to meet this customer's needs: Form a conservation team (coalition) of people at the state and local levels to cooperatively give producers the help they need to practice crop residue management.

Action Goal(s):

- Have crop residue management used on 6-million acres of HEL by 1995
- Garner active support and promotion of soil conservation measures by agribusiness and farm organizations through establishing a cooperative team approach
- On a county-by-county basis, increase participation in farmer-to-farmer information exchange activities regarding conservation issues

<u>Activity*</u>	<u>Who</u>	<u>Cost</u>	<u>Start</u>	<u>End</u>
•Develop and promote voluntary statewide farmer-to-farmer information exchange program aimed at farming economically and environmentally	NRCS/IASWCD/ Iowa Dept of Ag and Land Stew- ardship	\$40,000/yr	1991	Jan 1995 or when assumed by other groups
•Form a conservation team (coalition) of people at the state and local levels to cooperatively give producers the help they need to adopt conservation practices	NRCS is facilitator	—	Oct 1991	To continue as long as group is productive
•Cross-train agribusiness and conser- vation employees so that a consistent conservation message is given to producers	NRCS/ Agribusiness	Estimate \$10,000*	Oct 1991	Jan 94 for primary work, but to continue as appropriate
*Note: Actual plan had many more activities		*Estimate for materials and expenses for both SCS and agribusiness		

Evaluation: No-till farming tripled in two years since the marketing plan was implemented; crop residue use up 50 percent; being used in 75 percent of HEL plans; more than 1000 farmers participated in economic exchange program; alliance led to other cooperative projects; partners financed and distributed thousands of NRCS-developed information products.

PHASE 7– EVALUATE YOUR MARKETING EFFORT

After you have begun using your marketing plan to accomplish your goals, it's time to step back and evaluate to see what changes might be needed to make your marketing plan more successful.

QUESTIONS TO ASK

As with any new activity, you learn from experience. There are many questions you could ask to evaluate your effort. Here are a few:

- 1) Did you meet your action goals?
- 2) What worked well?
- 3) What didn't work?
- 4) What would you do differently next time?
- 5) What would you repeat?
- 6) Were your customers satisfied and their needs met effectively?

There is an evaluation section at the bottom of Worksheet 6 to record answers to your questions.

WHEN DO YOU CONDUCT EVALUATIONS?

There are two times when you should conduct an evaluation of your marketing effort. "During"—this allows for mid-course adjustments. "After"—this evaluation measures how well you achieved your goal after the marketing effort.

You might want to consider doing a "Before" evaluation to provide baseline or benchmark data before you implement your plan. You could also do an "Impact" evaluation. This evaluation measures long-term impact of marketing, and determines if the program's effects continue months or years after completion. This evaluation can be complex and should be conducted by a trained professional.

TASK

Review the case study examples for the evaluation part of Worksheet 6 on the previous page.

*"Even if you're on the right track,
you'll get run over if you just sit there."*

Mark Twain

APPENDIX A: MARKETING GUIDEBOOKS

Partnership Guide to Marketing

Provides detailed information about the marketing process, and explains why this process can be useful for promoting conservation services. This guide is useful for all phases discussed in the workbook.

Leadership Identification and Group Dynamics

Provides information about identifying and communicating with community leaders, and includes tips on holding more effective meetings. This guide is especially useful when applying Phases 1 and 2 of the marketing process as explained in this workbook.

Alliance/Partnership Building

Discusses methods for building effective alliances and partnerships to promote conservation goals. This guide is especially useful when applying Phase 2 of the marketing process as explained in this workbook.

Legislative Affairs

Provides an overview of how the legislative process works. This guide is especially useful when applying Phase 2 of the marketing process as explained in this workbook.

Conflict Management

Explains techniques for managing and resolving conflict situations. This guide is especially useful when applying Phases 2, 3 and 4 of the marketing process as explained in this workbook.

Information Gathering Techniques

Explains methods of collecting information from customers and other groups. This guide is especially useful when applying Phases 3 and 4 of the marketing process as explained in this workbook.

Reaching Out to Minority Groups

Covers various aspects of working with customers of different ethnic and racial background. This guide is especially useful when applying Phases 3 and 4 of the marketing process as explained in this workbook.

Guide to Direct Mail

Explains how to produce a direct mail campaign which reaches customers and gets responses. This guide is especially useful when applying Phase 4 of the marketing process as explained in this workbook.

Media Relations

Provides instructions for utilizing the media to promote conservation programs. This guide is especially useful when applying Phases 4, 6 and 7 of the workbook.

How to Obtain These Materials

Request these guidebooks from the NACD Service Center, P.O. Box 855, League City, Texas 77574. The phone number is 1-800-825-5547.

APPENDIX B: BLANK WORKSHEETS

WORKSHEET 1

CRITICAL ISSUES

1. Select the most critical ongoing or emerging conservation issues in your community that you want to address.

Issue:

We need to:

Issue:

We need to:

Issue:

We need to:

Issue:

We need to:

2. Check your highest priority issue, or combine related issues into a single issue, for which you will develop a marketing plan.

WORKSHEET 2

FORM AN ALLIANCE/IDENTIFY YOUR ROLE

1. For the issue you circled in Worksheet 1, list other groups in your community who are also addressing this issue. What can this group provide? How will this group benefit from cooperating with us?

Group

What they can provide

How alliance benefits them

2. For the issue you selected, complete the following phrases in as many ways as you can think.

a. We're the people who ...

b. No one, but no one, can _____ as well as we do.

c. We want to be seen as ...

3. Now go back and circle the phrases that most strongly convey who you are and what unique role you want to play
4. Based on the circled phrases in #2 above, and applying the four criteria for good role statements (short and to the point, use everyday language, convey character, and use action verbs), write your role statement here:
5. Test this with alliance members. Revise statement if necessary. This statement will change over time as you learn more about your alliance, customers or as the issue changes.

WORKSHEET 3

CATEGORIES OF CUSTOMERS

1. Make a complete list of your customers for the issue you have selected.

Who

What we want them to do

Benefit to them

WORKSHEET 4A

IDENTIFY CUSTOMER NEEDS

1. For your critical issue, use information gathering techniques to answer the following questions for each customer group identified in Worksheet 2. Complete this worksheet for *each* customer group.

What does your customer need to deal with this issue?

What services do you offer to help customers deal with this issue?

Why are customers not using the service as much as you like? What can you do to make this service more convenient and accessible to meet customer needs?

What services need to be developed to meet customer needs?

Where do customers get information about this issue and the service you or your partners provide?

What characteristics of customers (age, income, education, etc.) will affect how you provide services regarding this issue?

2. How will you get information about customer needs? Check all that apply.

- ☐ Existing information that you already have
- ☐ Existing information that your partners already have
- ☐ Printed information from previous studies, newspaper articles, etc.
- ☐ Gather information yourself with your partners through methods checked on Table 4
- ☐ Hire a consultant or use a volunteer who is a professional

WORKSHEET 4B

IDENTIFY ALLIANCE MEMBER NEEDS

For each customer group, visit with alliance members to get their perspective of customer needs and how they are dealing with them. Also visit with any potentially new alliance member/customers suggested in Worksheet 4A.

Customer:

Alliance Member(s):

How do we share this customer?

What does this alliance member(s) tell you the customer needs to deal with this issue?

What service(s) does this alliance member(s) offer to help your customers deal with this issue?

For this issue, how can how we work together to meet customer needs and achieve this alliance member(s) goals?

WORKSHEET 5

ACTION GOALS

1. Customer:

2. Based on the information you've gathered from customers and alliance members, what broad strategy will you use to address this critical issue?

3. Considering outside factors that may work for or against you, what is the best possible goal you can achieve in addressing this issue?

Goal:

By When:

Goal:

By When:

Goal:

By When:

WORKSHEET 6

DEVELOP THE MARKETING PLAN

Critical Issue:

Customer:

Customer Needs:

Identify Partners and Alliance Members:

Broad strategy you will use to meet customer needs:

Action Goal(s):

Activity

Who

Cost

Start

End

Evaluation:

SEVEN PHASES OF MARKETING

PHASE 1

Identify Critical Issues

PHASE 2

Develop Alliances and Determine Your Role

PHASE 3

Define Customers

PHASE 4

Identify Customer Needs

PHASE 5

Set a Strategy and Action Goals

PHASE 6

Develop and Activate the Marketing Plan

PHASE 7

Evaluate Your Marketing Effort

Appendix F: Funding Opportunities

Although watershed projects can be implemented without funding, it is difficult to change landowner attitudes and behaviors without it and funding should be considered a crucial tool in implementing a project. Funding opportunities are available if you know where to look for them. Potential funding sources can be found with federal, state, and county government agencies and non-government organizations. This appendix is a ample list, but there may be other sources not mentioned here. This appendix should also be updated as new sources are made available or current ones are eliminated.

There are generally two forms of funding, those that do not require a match and those that do. Staff should take full advantage of opportunities for no match funding. However, the amount of funding should be weighed against the amount of time required to complete the paperwork associated with the grant.

Staff should be careful before accepting funds that require a match to make sure that the match can be covered. Matches can come in two forms, financial or staff time/equipment (in-kind). If it is a financial match, it must be budgeted and approved before moving forward with the grant. This means that you will need to plan ahead at least a year in advance. On a time/equipment match, the match should not be more than 25% and preferably less than that. The Department already receives that match on our time through Federal Aid Reimbursements. Only time coded to Nonfederal Aid can be used for match on other federal funds.

Potential Funding Sources Not Requiring a Match

Federal Programs:

Farm Services Agency (FSA) –

<http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=landing>

- **Conservation Reserve Program (CRP)** – CRP is a voluntary program that helps agricultural producers safeguard environmentally sensitive land. CRP participants plant long-term, resource-conserving covers to improve the quality of water, control soil erosion, and enhance wildlife habitat. In return, FSA provides participants with rental payments and cost-share assistance. FSA administers CRP, while other USDA agencies and partners provide technical support.
- **CRP Continuous Sign-up Practices** - Environmentally desirable land devoted to certain conservation practices may be enrolled at any time under CRP continuous sign-up. Certain eligibility requirements still apply, but offers are not subject to competitive bidding.

CP5A	Field Windbreak Establishment
CP8A	Grass Waterways
CP9	Shallow Water Areas for Wildlife

CP15A	Establishment of Permanent Vegetative Cover on Contours
CP15B	Establishment of Permanent Vegetative Cover on Terraces
CP16A	Shelterbelt Establishment
CP21	Filter Strips
CP22	Riparian Buffers
CP23	Wetland Restoration
CP23A	Wetland Restoration, Non-Floodplain
CP24	Establishment of Permanent Vegetative Cover as Cross Wind Trap Strips
CP29	Marginal Pastureland Wildlife Habitat Buffer
CP30	Marginal Pastureland Wetland Buffer
CP31	Bottomland Timber Establishment on Wetlands
CP33	Habitat Buffers for Upland Birds
CP38E	State Acres for Wildlife Enhancement
CP39	FWP Constructed Wetland
CP40	FWP Aquaculture Wetland Restoration
CP41	FWP Flooded Prairie Wetlands

- **CRP General Sign-up** - Producers can offer land for CRP general sign-up enrollment only during designated sign-up periods. For information on upcoming sign-ups, contact your local FSA office.
- **Conservation Reserve Enhancement Program (CREP)** – CREP allows state and federal partnerships to work together to provide additional incentives payments for installing specific conservation practices that help protect environmentally sensitive land, decrease erosion, restore wildlife habitat, and safeguard ground and surface water.
- **Missouri Grassland Reserve Program (GRP)** - GRP is a voluntary conservation program that emphasizes support for working grazing operations, enhancement of plant and animal biodiversity, and protection of grassland under threat of conversion to other uses.

Natural Resources Conservation Service (NRCS) –

<http://www.mo.nrcs.usda.gov/programs/>

- **Environmental Quality Incentive Program (EQIP)** - EQIP offers contracts with a minimum term that ends one year after the implementation of the last scheduled practices and a maximum term of ten years. These contracts provide financial assistance to implement conservation practices. Owners of land in agricultural production or persons who are engaged in livestock or agricultural production on eligible land may participate in the EQIP program.
- **Wildlife Habitat Incentive Program (WHIP)** - WHIP is a voluntary conservation program. It encourages the creation of high quality wildlife habitats that support

wildlife populations of national, state, tribal, and local significance. Through WHIP, landowners may receive financial and technical assistance to develop upland, wetland, riparian, and aquatic habitat areas on their property.

- **Conservation Stewardship Program (CSP)** - CSP encourages agricultural and forestry producers to maintain existing conservation activities and adopt additional ones on their operations. CSP is a new voluntary conservation program that provides financial and technical assistance to conserve and enhance soil, water, air, and related natural resources on their land. CSP provides opportunities to both recognize excellent stewards and deliver valuable new conservation.
- **Wetland Reserve Program (WRP)** – Landowners who choose to participate in WRP may sell a conservation easement or enter into a cost-share restoration agreement with NRCS to restore and protect wetlands. The landowner voluntarily limits future use of the land, yet retains private ownership. The landowner and NRCS develop a plan for the restoration and maintenance of the wetland.
- **PL-566 Watershed Program** - The Watershed Protection and Flood Prevention Act (PL-566) authorizes the NRCS to help local organizations and units of government plan and implement watershed projects. PL-566 watershed projects are locally led to solve natural and human resource problems in watersheds up to 250,000 acres (less than 400 square miles).

State Programs:

Missouri Department of Conservation (MDC) - <http://intranet/content/pls/>

- **Landowner Assistance Program Private Land Incentive Docket** - Department of Conservation technical and financial assistance is available upon request, first come, first served, to any Missouri landowner, regardless of legal residence. No landowner shall receive more than \$4,000/year in MDC cost share funds without approval from the Regional Coordination Team (RCT).
- **Priority Focus Area (PFA)** - Based on RCT determination, landowners completing select habitat practices within MDC designated PFA (e.g., quail and grassland bird (QGB), grassland coalition, Conservation Opportunity Areas (COAs), priority watersheds, etc.) may be eligible to receive increased cost-share beyond the standard rate outside of designated focus areas. **RCTs are required to identify eligible focus areas in their regions and share their regional list with all regional staff as well as their individual division leadership and the PLS LAP Coordinator.** The list of focus areas approved for increased cost-share eligibility in a region should be determined no later than August 1 annually and should occur simultaneously with RCT adoption of the statewide docket.

Missouri Department of Natural Resources (MDNR) - <http://www.dnr.mo.gov/>

- **Soil and Water Conservation Districts (SWCD) -** http://www.dnr.mo.gov/env/swcp/service/Salt/available_practices.htm
 - **SWCD Cost-Share Program** - A portion of the parks, soils and water sales tax is used for Missouri landowners to install [soil and water conservation practices](#), which are available through the state cost-share program. These practices conserve soil, which consequently improves water quality by reducing sedimentation in our rivers and streams. The practices reduce soil erosion by a variety of methods that may include increasing crop residue, improving vegetation, diversion or containment of water to facilitate slower release, protection of stream bank and forested areas from livestock, and reduction of wind erosion. Contact your local SWCD for cost share practices available in your counties.

Potential Funding Sources Requiring a Match

Federal Programs:

Fish and Wildlife Service (FWS) – www.fws.gov

- **Partners for Fish and Wildlife Program** - The Partners for Fish and Wildlife Program Act authorizes the Secretary of Interior to provide direct technical and financial assistance to private landowners interested in restoring, enhancing, and managing fish and wildlife habitats on their own lands. It is a goal of the program to secure at least 50 percent of project costs from non-Service sources, but this goal applies to the national program as a whole, and does not have to be achieved on a project-by-project basis. Funding above \$25,000 for an individual project must be approved at the Washington Office level. If you are interested in pursuing a project under the Partners for Fish and Wildlife Program you must contact your local coordinator. A listing of coordinators by state is available at <http://www.fws.gov/partners/>
- **Endangered Species Act Section 6 Program** - Section 6 of the Endangered Species Act authorizes the Secretary of the Interior to enter into a cooperative agreement with any State that establishes and maintains an adequate and active program for the conservation of endangered and threatened species. Under Section 6, the Service provides 75 percent of project funds that can be used for tasks covering all phases of the Act, from prelisting to delisting. Contact Peggy Horner (MDC) for information that may be applicable for your watershed.
- **National Fish Habitat Action Plan** – This is a national investment strategy to leverage federal and privately raised funds to protect, restore, and enhance the nation’s fish and aquatic communities through partnerships that foster fish habitat

conservation. Funds appropriated to the FWS Fisheries Program specifically to implement the Action Plan will be utilized in collaboration with the National Fish Habitat Board and Fish Habitat Partnerships. Fish Habitat Partnerships are the primary work units of the Action Plan, formed around distinct geographic areas, “keystone” fish species, or system types (e.g., large lakes, impoundment, estuaries). Funds will support national and regional coordination activities as well as cost-shared projects to protect, restore, or enhance fish habitats. All or a portion of project funds may be transferred to partner organizations if the Service lacks the capability to implement a project. Every project must be identified in the Fisheries Operational Needs System (FONS), a database that identifies the operational needs of Fisheries Program field stations, including fish habitat project needs. Fisheries Program field offices will work with Fish Habitat Partnerships to identify fish habitat projects, and enter them into the FONS. <http://fishhabitat.org/>

State Programs:

Missouri Department of Natural Resources (MDNR) - <http://www.dnr.mo.gov/>

- **Missouri’s Section 319 Nonpoint Source Program** – Section 319 grant funds are provided from [U.S. Environmental Protection Agency \(EPA\)](#) through [Section 319\(h\) of the Clean Water Act](#). Funds are used to address NPS pollution and are administered from the [EPA, Region 7 Office](#) through the Missouri Department of Natural Resources to eligible sponsors. Funds can be used to address NPS pollution through information/education and to conserve, restore, or improve water quality in priority watersheds. Eligible sponsors include state and local agencies, educational institutions, and nonprofit organizations with 501(c)(3) status.
<http://www.dnr.mo.gov/env/wpp/nps/>
- **Major Subgrants** – Grants can be requested annually in the amount of \$5,000 to \$1,000,000. The project can last up to 4 years and will require a 40 percent non-federal match.
- **Minigrants** – Grants can be requested up to \$10,000. The project can last up to 2 years and will require a 40 percent non-federal match.
- **Management Plan Development** – Grants can be requested quarterly for up to \$15,000. The project can last up to 2 years and will require a 40 percent non-federal match.

Non-Governmental Organizations (NGO’s):

Missouri Conservation Heritage Foundation (MCHF) – MCHF is a nonprofit, charitable organization that helps meet financial needs placed on natural resource conservation and conservation-related outdoor recreation.
<http://missouriconservationheritagefoundation.org/content/home.php>

- **Stream Stewardship Trust Fund (SSTF)** - Use of SSTF is available to projects that restore, enhance, or protect Missouri's stream resources. All practices proposed must fulfill this objective. Proposed projects will be prioritized and funded by the MCHF based on regional stream needs, maximum return on expended monies, level of threat to the stream system, and overall anticipated benefits to stream resources. Perpetual easements will receive priority consideration over 30-year easements. Applicants are encouraged to submit projects that address priority watersheds and demonstrate watershed impacts rather than single, isolated projects. Requires some match.
- **Conservation and Outdoor Recreational Projects** – MCHF will fund projects that have financial support from several other partners and they will address targeted conservation needs within Conservation Opportunity Areas, priority streams, areas with high outdoor recreational potential, or serve Missourians with limited opportunities to learn about and enjoy the fish, forest, or wildlife resources of the state.

American Land Conservancy (ALC) – ALC is a national, non-profit land conservation organization that conserves landscapes for the benefit of people and wildlife. They work in partnership with communities, landowners, non-profit organizations, corporations, and public resource agencies to create innovative and effective conservation solutions. Through land acquisition, conservation easements, restoration, and stewardship, ALC has secured hundreds of thousands of acres for wildlife habitat. <http://www.alcnet.org/>

Nature Conservancy – The mission of the Nature Conservancy is to pursue the plants, animals and natural communities that represent the diversity of life on earth by protecting the lands and water they need to survive. <http://www.nature.org/>

National Fish and Wildlife Federation – The National Fish and Wildlife Foundation (NFWF) is a 501(c)(3) non-profit that preserves and restores our nation's native wildlife species and habitats. Created by Congress in 1984, NFWF directs public conservation dollars to the most pressing environmental needs and matches those investments with private funds. The Foundation's method is simple and effective: they work with a full complement of individuals, foundations, government agencies, nonprofits, and corporations to identify and fund the nation's most intractable conservation challenges. <http://www.nfwf.org/>

Ozark Regional Land Trust - <http://www.orlt.org/>

National Wild Turkey Federation - <http://www.nwtf.org/>

Quail Unlimited - <http://www.qu.org/>

Pheasant Forever - <http://www.pheasantsforever.org/>

North America Bird Conservation Initiative - <http://www.nabci-us.org/>

Appendix G: Detailed Monitoring Strategies and Techniques

Introduction:

To minimize confusion, the initial characterization of the watershed and stream will be referred to as **baseline assessment** and any subsequent assessment work will be referred to as **monitoring**. Many tools can be used for both baseline assessment and for monitoring. This appendix will primarily discuss in-channel and management activities. Watershed characterization is covered in Appendix C.

The purposes of **baseline assessment** are to determine the current condition of the stream and watershed, identify if potential impairment issues (as defined by Missouri DNR) exist, and determine appropriate management actions for a long term goal of maintaining or improving ecosystem health and resiliency. Having adequate baseline assessments may be crucial for obtaining funding and partner buy-in. Important side benefits that can occur during the baseline assessment includes gaining a better understanding of the ecosystem and finding potential reference reaches which can be used by MDC and DNR when assessing other streams in the state.

The purpose of **monitoring** is to take measurements to attempt to determine if watershed objectives are being met. This means that the ability to measure an effect within the desired timeframe must be considered when writing objectives. As an example, assume that in the baseline assessment it was determined that increasing the forested riparian corridor would be a long-term benefit to the stream ecosystem. Next assume that funding was provided for corridor work and the funding source wants positive results within a two to three year timeframe. In this case, a reasonable objective is: to establish appropriate riparian vegetation on XXX linear feet of stream. This will perhaps require some report of the number of linear feet planted and some measurement of growth and survival of the vegetation. This does not preclude MDC having longer term objectives for a riparian corridor which provides multiple functions or objectives related to maintenance/enhancement of the stream biodiversity, which would have different measures.

Most of the literature regarding stream and watershed assessment is based on the concept that there are one or more factors causing an impairment of the stream condition. The idea then is to determine the factor(s) and fix the problem(s). It is appropriate to utilize some definitions from the EPA Guidelines for Ecological Risk Assessment which distinguish stressors causing impairment and the sources of those stressors.

- **Stressor** – Any physical, chemical, or biological entity that can induce an adverse response.
- **Source** – An entity or action that releases to the environment or imposes on the environment a chemical, physical, or biological stressor or stressors.

In this terminology, sediment is a stressor and livestock with stream access are a source of that stressor. Another useful term is a sink. The following definition is adapted from the EPA definition of a sink.

- **Sink** – An entity or action that removes from the environment a chemical, physical, or biological stressor or stressors.

Examples of sinks would be sediment deposition in riparian zone, and denitrification within riparian soils or the hyporheic zone.

In Missouri, DNR has the responsibility to determine if a stream is impaired and if so to determine the cause (stressors and sources), list the stream reach on the 303(d) list, and to develop a plan to bring the stream to a non-impaired condition (a TMDL). DNR has a listing methodology document (LMD) which details the criteria and methods that are used to determine legal impairment. Here are examples for aquatic life protection from the LMD:

Type of Standard	Analyte	Decision Rule (impairment)
Numeric	Temperature, dissolved oxygen	>10% exceed criterion
Numeric	Fish tissue concentrations	Upper Confidence Interval exceeds criterion
Narrative	Objectionable bottom deposits	>10% coverage by material
Narrative	Color	Significant compared to control
Narrative	Biological Fauna – Invertebrates	Stream Condition Index < 14 for 75% of sites

The following are possible findings and responses when conducting the baseline assessment.

Finding	Response
Background data check shows impairment already determined by DNR for some watershed streams	Reassess priority and work within DNR framework for impaired waters
Baseline assessment using methods from DNR LMD shows possible impairment	Report data to DNR, reassess priority and work within DNR framework
Baseline assessment (LMD) shows no impairment	Conduct management actions to maintain or enhance stream ecosystem health and resiliency. Assess as candidate for outstanding or reference water of the state

A finding of non-impairment does not mean that the stream is unaffected by watershed alterations or that it has sufficient resilience to withstand future watershed or climatic alterations. A finding of non-impairment does require a shift from the typical mindset of finding and fixing impairment to what should be done to maintain or improve a system that is currently in good condition. This means that management activities can be based on issues generally known to promote watershed/stream ecosystems, such as riparian buffer zones, rather than trying to determine a specific limiting factor. For example, there may be evidence of nutrient enrichment in a stream, but in-stream conditions have not attained a level that can be detected by currently available in-stream assessment methods. Nonetheless, long-term management activities to reduce nutrient runoff would be warranted. All stressors, sources, and sinks may not be equal,

but they are all important, especially when taking a long-term view and considering the probable synergistic effects.

As discussed earlier, many assessment methods are appropriate for both baseline assessment and for monitoring. Keys to deciding on methods include:

- what type of data are needed,
- which available protocol can best provide these data,
- whether a protocol was designed for the situation (for example a wadeable stream method probably will not work in a non-wadeable stream),
- how much time the method requires,
- training required to produce reliable data,
- and for monitoring, whether the method will show results within the timeframe of the objective.

Assessment and Monitoring methods can be divided into

1. measurement of watershed conditions
2. direct measurement of management activities
3. in-channel (including riparian) assessment of biota, physical habitat, and water quality
4. measurement of changes in stressor levels

Evaluation of watershed conditions is covered in Appendix C. Direct measurement of management activities not only provides useful data for reporting on short term objectives, it also can supply information assessing difficulties in the implementation of BMPs. Note that it is appropriate to not only check on conditions during the baseline assessment, but also as an ongoing monitoring effort to keep track of changes within the watershed as this may lead to the need for a change in management activities. It is important to remember the dynamic nature of stream systems, and to consider the lag time variable. It often takes many years to detect in-channel responses to the implementation of BMPs or other management activities.

The following outline and table contains information regarding protocols, which are currently in use by MDC staff for in-channel assessment and measurement of management activities. All of these protocols may be appropriate for use in baseline assessments or long term monitoring activities, provided they relate to the objectives for the watershed. The intent of this information is to allow staff to choose methods that fit with available staff time, expertise, and the objective for which the method is intended. As new methods are developed and tested, this appendix will be updated.

Toolbox of Methods for Assessment and Monitoring of Priority Watersheds

1. **Land Use or Land Cover**

- a. *Aerial photography/GIS coverage*
 - i. Data can be quantified/tracked with GIS.
 - ii. Corridor effects may be observed earlier, while in-channel responses may take longer to occur and are also site dependent.

2. **Management Actions**

- a. *Photo Points*
 - i. While the use of photographs is subjective and may not provide quantifiable data, it can be a useful tool in documenting implementation and impacts of BMPs.
 - ii. Corridor effects may be observed earlier, while in-channel responses may take longer to occur and are also site dependent.
- b. *Tracking of BMP numbers implemented within the watershed* (e.g., acreages and miles, number of improved sites, growth and survival of trees, etc.).

3. **Fish Sampling**

- a. *Fisheries Management Population Sampling*
 - i. Specific fish populations are sampled using one or a combination of a variety of methods including, but not limited to, seining, electrofishing, hoop netting, gill netting, trotlining, hook-and-line fishing, and snorkeling to determine population characteristics such as size structure or density. Electrofishing equipment can add to cost.
 - ii. Additional information:
 - (1) Bonar, S. A., W. A. Hubert, and D. W. Willis, editors. 2009. Standard methods for sampling North American freshwater fishes. American Fisheries Society, Bethesda, Maryland.
 - (2) Murphy, B. R., and D. W. Willis, editors. 1996. Fisheries Techniques, 2nd edition. American Fisheries Society, Bethesda, Maryland.
- b. *Resource Assessment and Monitoring (RAM) Protocol*
 - i. Fish communities are collected by seining and electrofishing the site between blocknets.
 - ii. Additional information:
 - (1) Fischer, S. and M. Combes. 2003. Resource Assessment and Monitoring Program: Standard Operation Procedures – Fish Sampling. Missouri Department of Conservation, Jefferson City, Missouri.
 - (2) Doisy, K.E., C.F. Rabeni, M.D. Combes, and R.J. Sarver. 2008. Biological criteria for stream fish communities of Missouri. Final Report to the Environmental Protection Agency Region 7.
 - (3) MDC Resource Science Division.

4. **Benthic Macroinvertebrate Sampling**

- a. *DNR Biocriteria/MDC RAM Protocol*
 - i. Multi-habitat sampling, with laboratory processing of organisms to lowest taxonomic level.

- ii. This protocol provides quantifiable results with a very high level of data acuity. However, it requires a large time commitment (average time per site is 30+ days), as well as a high level of expertise in specimen identification.
 - iii. For additional information:
 - (1) Missouri Department of Natural Resources. 2001a. Semi-quantitative macroinvertebrate stream bioassessment project procedure. Air and Land Protection Division, Environmental Services Program, Jefferson City, Missouri. 24 pp.
<http://www.dnr.mo.gov/env/esp/docs/BiologicalCriteriaMUFinalReport.pdf>.
 - (2) Missouri Department of Natural Resources. 2002. Criteria for wadeable streams/perennial streams of Missouri. Air and Land Protection Division, Environmental Services Program, Jefferson City, Missouri. 47 pp.
<http://www.dnr.mo.gov/env/esp/docs/BiologicalCriteriaforWadeableStreams.pdf>.
 - b. *Draft Stream Team Volunteer Water Quality Monitoring (ST VWQM) EPT Protocol*
 - i. EPT sampling is geared towards targeting juvenile forms of the orders Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) to gain a more accurate reflection of water quality.
 - ii. Coarse substrate sampling (with alternate habitat protocols if needed) with laboratory processing of EPT organisms to family level.
 - iii. This protocol provides quantifiable results, but loses some data acuity. It does not require as large of a time commitment (average time per site is approximately three to five days including sampling, identification, and analysis), but still requires specimens to be identified in the lab.
 - iv. Currently still in Draft form.
 - v. For additional information contact: MDC Fisheries Division – ST VWQM Program Coordinator (MDC Central Office).
 - c. *ST VWQM Protocol*
 - i. Coarse substrate sampling (with alternate habitat protocols if needed), with field identification to appropriate taxonomic level (generally order), and numeric WQM rating calculated.
 - ii. This protocol provides quantifiable results, but loses some additional data acuity. It is a quick method (average time per site is approximately 1 hour), and offers the ability to conduct identification and calculation in the field.
 - iii. For additional information:
 - (1) Missouri Stream Team Website (www.mostreamteam.org).
 - (2) MDC Fisheries Division – ST VWQM Program Coordinator (MDC Central Office).
 - (3) Training notebooks: <http://www.dnr.mo.gov/env/wpp/vmqmp/vwqmp-workshops.htm>.
5. **Other Taxa-Specific Sampling** (could include, but not limited to)
- a. *Crayfish*
 - i. Qualitative sampling for rare taxa or developing a species list could include a variety of methods including, but not limited to, seining, hand collection, use of baited traps, and or netting during electrofishing.

- ii. Use of the 1 m² quadrat sampling method would be most appropriate to assess relative densities or other quantitative sampling.
- iii. For additional information:
 - (1) MDC Resource Science Share Point
(<http://mdcsharepoint/sites/resource/science/Documents/Forms/RS.aspx> - Aquatics and Wetland Systems: Invertebrates).
 - (2) MDC Resource Science Division – (Resource Science Center).
- b. *Mussels*
 - i. Qualitative sampling for rare taxa or developing a species list could include a variety of methods including, but not limited to, timed visual searches in all available habitat, or groping or tactile searches.
 - ii. Quantitative sampling methods could include the use of 0.25 m² quadrats located randomly or along transects.
 - iii. For additional information:
 - (1) MDC Resource Science Share Point
(<http://mdcsharepoint/sites/resource/science/Documents/Forms/RS.aspx> - Aquatics and Wetland Systems: Invertebrates).
 - (2) MDC Resource Science Division – (Resource Science Center).

6. **Physical Habitat**

- a. *RAM Protocol*
 - i. Physical habitat is assessed following Kaufmann (1999). Various channel and habitat characteristics are measured across 11 transects and down the thalweg of the stream. Measurement or estimates of components are conducted in several habitat categories. Some of these are inherently subjective, but should give an indication of general stream condition.
 - ii. Average time per site is likely one to four days, including actual marking, sampling, and data entry/analysis. One average-sized site can usually be sampled per day.
 - iii. For more information:
 - (1) Kaufmann, P., P. Levine, E. Robison, C. Seegler, and D. Peck. 1999. Quantifying physical habitat in wadeable streams. EPA/620/R-99/003. U.S. Environmental Protection Agency, Washington, D.C.
<http://www.epa.gov/emfjulte/html/pubs/docs/groupdocs/surfwatr/field/phyhab.html>.
 - (2) MDC Resource Science Division.
- b. *ST VWQM Protocol*
 - i. Physical habitat is assessed in three separate assessments. The total time for all assessment methods is approximately 2.5-3 hours. Some assessments are inherently subjective, but should give an indication of general stream condition.
 - (1) The site selection process addresses presence of various aquatic habitat types, general riparian condition, presence of algae, substrate type, presence of aquatic life, and presence of various land uses within the watershed. Approximate time per site is 0.5 to 0.75 hour.
 - (2) The visual survey assigns relative percentages of land use and watershed characteristics within a 300-foot reach encompassing the floodplain, stream

banks and stream bed composition characteristics. Approximate time per site is 0.5 to 0.75 hour.

ii. For additional information:

- (1) Missouri Stream Team Website (www.mostreamteam.org).
- (2) MDC Fisheries Division – ST VWQM Program Coordinator (MDC Central Office).
- (3) Training notebooks: <http://www.dnr.mo.gov/env/wpp/vmqmp/vwqmp-workshops.htm>.

7. **Stream Discharge**

a. *Calculating Stream Discharge*

- i. This task includes taking stream width and depth measurements across a transect within the sampling site to determine the cross-sectional area, as well as velocity measurements across the width of the stream. Approximate time per site is 0.5 to 0.75 hour.
- ii. For additional information:
 - (1) *USGS Stream Gages* – <http://mo.water.usgs.gov/>
 - (2) *ST VWQM* – See above

8. **Water Chemistry**

a. *RAM Protocol*

- i. Seventeen WQ variables are measured with either field meters or by submitting water samples to the Limnology Laboratory at the University of Missouri.

b. *ST VWQM Protocol*

- i. A standard suite of six WQ parameters are measured in the field by individuals that have attended the appropriate WQM Training.
- ii. Equipment for up to an additional five parameters is available on a case-by-case basis for volunteers successfully completing the Level 2 QAQC Certification Training.
- iii. Approximate time per site is one to two hours.
- iv. For additional information:

- (1) Missouri Stream Team Website (www.mostreamteam.org).
- (2) MDC Fisheries Division – ST VWQM Program Coordinator (MDC Central Office).
- (3) Training notebooks: <http://www.dnr.mo.gov/env/wpp/vmqmp/vwqmp-workshops.htm>.

c. *USGS Stream Gages* – Select gaging stations collect various WQM parameters

d. *Other*

- i. There are currently no „standardized“ parameters, equipment, or procedures for the collection of WQM chemical monitoring within the Division, but other methods have included methods such as deployment of automated samplers or data sondes. Time estimates given are based on experience from MDC fisheries management biologists.

Matrix of Methods for Assessment and Monitoring of Priority Watersheds

	Toolbox Reference	Baseline Assessment and/or Long-term Monitoring	Objective Driven Monitoring	Degree of Special Expertise/Training	Time Commitment (per site)	Relative Cost	Results Observed in "Relatively" Short Order After BMP	Captures Data at Optimum Times	Quantifiable/ Repeatable
Direct Measures of Mgt. Activities									
Aerial Photography/GIS	1.a.	Yes	Yes	Low	2-4 hrs.	Low	Sometimes	Yes	Yes
Photo Points	2.a.	Yes	Yes	Low	1 hr.	Low	Sometimes	Yes	No
BMP Tracking	2.b.	Yes	Yes	Low	2-4 hrs.	Low	Yes	Yes	Yes
Biological Sampling									
Fish									
Fish Mgt. Population	3.a.	Yes	No	Moderate	8-12 hrs.	Low/Mod	Sometimes	Yes	Yes
RAM Sampling	3.b.	Yes	No	Moderate	8-12 hrs.	Moderate	Sometimes	Yes	Yes
Macroinvertebrate									
DNR/RAM Protocol	4.a.	Yes	No	High	30+ days	High	Sometimes	Yes	Yes
ST VWQM EPT Protocol	4.b.	Yes	No	Moderate	2-4 days	Moderate	Sometimes	Yes	Yes
ST VWQM Protocol	4.c.	Yes	No	Moderate	1-2 hrs.	Low	Sometimes	Yes	Yes
Taxa Specific (e.g. crayfish/mussels)	5.a. 5.b.	Yes	No	Moderate	1-2 days	Low/Mod	Sometimes	Yes	Yes
Physical Habitat									
RAM Protocol	6.a.	Yes	No	Low	6-8 hrs.	Moderate	Sometimes	Yes	Sometimes
ST VWQM Protocol	6.b.	Yes	No	Low	2-3 hrs.	Low	Sometimes	Yes	Sometimes
Stream Discharge									
USGS Stream Gages	7.a.	Yes	No	Low	1-2 hrs.	Low	No	Yes	Yes
ST VWQM Protocol	7.a.	Yes	No	Low	1 hr.	Low	No	Sometimes	Yes
Water Chemistry									
RAM Protocol	8.a.	Yes	No	Moderate	1 hr.	Moderate	No	Sometimes	Yes
ST VWQM Protocol	8.b.	Yes	No	Moderate	1-2 hrs.	Moderate	No	Sometimes	Yes
USGS Stream Gages	8.c.	Yes	No	Low	1 hr.	Low	No	Sometimes	Yes
Automated Samplers	8.d.	Yes	No	Moderate	8+ hrs.	High	No	Yes	Yes
Data Sondes	8.d.	Yes	No	Mod/High	4-5 hrs./mo.	High	Sometimes	Yes	Yes

Example 1:

Watershed Project in the Prairie Ecoregion

Scenario:

The Sand Creek Watershed is a priority watershed in the Prairie Ecoregion. The watershed was chosen as a priority watershed because historic sampling records indicate the watershed contains robust populations of a state listed fish species and a diverse fish community. Also, 25% of the watershed consists of public land (a combination of MDC and DNR) and private land owned by conservation-partnering NGOs (TNC and MPF). Current land use in the watershed is 60% pasture, 40% woodland, 15% row crop, and 5% native grassland. Review of existing data reveals that one randomly chosen RAM fish and physical habitat survey was conducted near the downstream boundary of the watershed in 2001 at a 4th order stream site. Two heritage records, one from 1960 and another from 1994, document the presence of a state listed fish at one coordinate location within the watershed. There are no fish survey records for streams third order or smaller in the watershed. The primary use of streams in the watershed is for livestock watering. While the majority of the land within the watershed is owned by local livestock producers, much of the large woodland tracts are owned by absentee landowners and used for hunting and other outdoor recreation.

Watershed level threat assessments from MoRAP and DNR GIS layers indicate one CAFO and five abandoned coal mines are present. Recent (within the last two years) aerial photos show adequate riparian buffers throughout the woodland tracts and inadequate buffers along pasture and bottomland row crops. Additionally, some local channelization and agricultural levee building has occurred along mainstream Sand Creek. There have been two regulated historic fish kills on a tributary to Sand Creek, attributed to the upstream CAFO. NRCS records indicate a high interest in federal Farm Bill programs; however, few participants have enrolled their property into livestock exclusion or riparian enhancement practices. Absentee landowners within the watershed have expressed to Resource Foresters and Private Land Conservationists interest in improving wildlife habitat and forest production on their recreational property.

Management Objectives:

1. Maintain current level of aquatic community diversity
2. Conduct outreach to private landowners in order to implement watershed improvement practices including the following activities:
 - a. Protecting high quality existing riparian corridor on five miles of stream.
 - b. Increasing riparian corridor to a buffer minimum of at least 100 feet on 10 miles of stream.
 - c. Limiting livestock access to streams.
 - d. Improving stream-floodplain connectivity.

Baseline data collection conducted prior to initiating management activities

Biotic-

The current year is 2010. Since there have been no surveys in the watershed for nine years, and there is only one RAM protocol fish community survey on record, conduct fish, crayfish, and mussel surveys at a limited number of sites. Use standardized statewide sampling methods to sample fish, crayfish, and mussel populations (*tools 3.b., 5.a., 5.b.*). Consider using a weighted random sampling scheme based on stream order when selecting sampling locations. This

sampling will provide staff with a current overview of aquatic species distributions within the watershed and may lead to the discovery of undocumented species, aquatic invasives, or high quality stream reaches worthy of increased protection through conservation easements or Natural Area designations. This sampling may lead staff to discover previously unknown impairments within the watershed and may also provide an outreach and education tool to promote stakeholder enthusiasm for protecting the watershed's aquatic life.

Repeat biological surveys at regular intervals as determined by management objectives, the demand for current data, and resources available to gauge general aquatic species trends but not improvements in the watershed from on-the-ground practices.

Physical-

Consider the management objectives, data need, and time and resources available and select an appropriate physical habitat sampling protocol (for example RAM phy-hab) to meet your specific needs (*tool 6.a.*). If staff decide that detailed physical measurements are not necessary, draw a habitat sketch of your sampling reach and record detailed field observations of stream habitat sampled. At all surveyed sites, take several photos of the stream substrate, channel, banks, and riparian conditions (*tool 2.a.*).

Chemical-

At your baseline survey sites for fish, crayfish, and mussels, measure a limited number of water quality variables (temperature, pH, dissolved oxygen, conductivity, etc.) and other variables of interest that reflect your management goals and that you have the resources available to sample (*tool 8.b.*).

Possible monitoring activities to evaluate progress of management objectives

- 1. Management Objective: Maintain current level of fish, crayfish, and mussel community diversity and health**
 - a. Field (In-channel) monitoring activities
 - i. Conduct periodic evaluations of fish, crayfish, and mussel communities using standardized community sampling protocols (*tools 3.b., 5.a., 5.b.*). The number of sampling sites and time between surveys depends on long-term data needs and resources available.
 - b. Office-based monitoring activities
 - i. Data entry and analysis associated with field data collection.
- 2. Management Objective: Protecting existing high quality riparian buffer on five miles of stream through conservation easements**
 - a. Field (In-channel) monitoring activities
 - i. Work with Resource Forester to inventory private bottomland forest tracts.
 - ii. Randomly sample easements to enforce compliance and ensure protection.
 - b. Office-based monitoring activities
 - i. Keep record of acres and miles of riparian buffer protected. Record number of landowners involved and number of conservation easements established (*tool 2.b.*).

- ii. Use aerial photos of areas to track changes in riparian buffer growth and riparian land use change over time (*tool 1.a.*).
- 3. **Management Objective: Increase riparian buffer to 100 feet wide on 10 miles of stream**
 - a. Field (In-channel) monitoring activities
 - i. Take several photos in the upstream and downstream direction of the riparian zone prior to buffer installation and at regular intervals following installation (*tool 2.a.*).
 - ii. Randomly sample areas to determine the percentage of tree plantings surviving to age five (*tool 2.b.*).
 - b. Office-based monitoring activities
 - i. Keep record of acres and miles of riparian buffer established or enhanced. Record number of landowners involved and number of conservation easements established (*tool 2.b.*).
 - ii. Use aerial photos of areas to track changes in riparian buffer growth and riparian land use change over time (*tool 2.b.*).
- 4. **Management Objective: Provide outreach to landowners regarding livestock exclusion**
 - a. Field (In-channel) monitoring activities
 - i. Take several photos of the riparian zone and stream bank before and after livestock exclusion (*tool 2.a.*).
 - ii. Track the number of educational and outreach programs given to watershed residents (*tool 2.b.*).
 - b. Office-based monitoring activities
 - i. Keep record of the miles of livestock exclusion fencing installed, the number of livestock units excluded, and the number of landowners participating in livestock exclusion practices (*tool 2.b.*).
- 5. **Management Objective: Provide outreach to landowners regarding the importance of floodplain connectivity**
 - a. Field (In-channel) monitoring activities
 - i. Take several photos of agricultural levees before and after their removal (*tool 2.a.*).
 - ii. Take yearly driving/floating/flying tour along Sand Creek floodplain to document new levee construction.
 - iii. Track the number of educational and outreach programs given to watershed residents (*tool 2.b.*).
 - b. Office-based monitoring activities
 - i. Keep record of the miles or numbers of levees removed/notched and the number of acres of bottomland accessible to flooding (*tool 2.b.*).
 - ii. Keep record of the miles or numbers of levees built and the number of acres of bottomland inaccessible to flooding.

Example 2: Watershed Project in the Ozark Ecoregion

Scenario:

The Grizzly Creek Watershed is a priority watershed in the Ozark Ecoregion. The watershed was chosen as a priority watershed because past sampling records and knowledge from regional staff have indicated the watershed contains high biodiversity of fish, crayfish, and mussel species. Also, thirty percent of the watershed consists of public land (a combination of MDC, DNR, and USFS ownership). Current land use in the watershed is 60% forest, 30% pasture, and 10% urban development. Review of existing data reveals that one randomly chosen RAM fish and physical habitat survey was conducted near the downstream boundary of the watershed in 2001 at a 5th order stream site. A heritage record from 1987 documents the presence of a state imperiled crayfish species. Two heritage records, one from 1960 and another from 1994, document the presence of a state critically imperiled fish at one coordinate location within the watershed. There are no fish survey records for streams third order or smaller in the watershed. The downstream portion of the watershed is a popular smallmouth bass and rock bass fishery and this portion of the watershed experiences heavy traffic by paddlers during summer months.

Although the watershed is a good example of aquatic biodiversity and the majority of stream channel is buffered by an adequate riparian zone, there are several threats to watershed and aquatic community health. Upstream and downstream from the heritage record for the state critically imperiled fish species, there are several poorly designed stream crossings. From aerial photographs and field reconnaissance, it has been determined that approximately 10 miles of stream do not have an adequate riparian buffer and several grazing operations exist which allow cattle direct access to the stream channel. In one tributary in the watershed, there is excessive filamentous algae growth, and two recorded water quality samples indicate that this tributary has elevated nutrient levels in comparison to other streams in the watershed. The suspected cause of elevated nutrient levels in this tributary are two large grazing operations which allow cattle direct access to the stream. It is known that many rural landowners have poorly maintained or failing septic systems, and this problem is likely widespread throughout the watershed. USGS topographic maps reveal the presence of several sinkholes throughout the watershed, and it is believed that some of these sinkholes were once used as trash dump sites. The 10% urban land use within the watershed consists of three small communities which are anticipated to grow in the next 10 years as more people from out-of-state relocate to the Ozarks.

There are three active Stream Teams in the watershed. There is a watershed improvement association for the larger drainage basin that includes this priority watershed.

Management Objectives:

1. Restore aquatic organism passage in stream reaches fragmented by poorly designed stream crossings.
2. Maintain current level of aquatic community diversity and health.
3. Maintain presence of Species of Conservation Concern (SOCC) at known locations and increase known locations of SOCC throughout the watershed.
4. Maintain desirable CPUE and size structure of smallmouth bass and rock bass populations.
5. Conduct outreach to private landowners and communities in order to implement watershed improvement practices including the following activities:

- a. Increasing riparian corridor to a buffer minimum of at least 100 feet on 10 miles of stream.
- b. Limiting livestock access to streams.
- c. Partnering with a local watershed association to sponsor septic tank maintenance and septic tank replacement.
- d. Reducing storm water runoff from urban areas by working with communities to reduce the amount of newly developed impervious surfaces and install storm water BMPs (pervious pavement, rain gardens, storm water retention basins, bioswales, etc.).
- e. Locating sinkhole dump sites and cleaning up these sites.

Baseline data collection conducted prior to initiating management activities

Biotic-

The current year is 2010. Since there have been no surveys in the watershed for nine years, and there is only one RAM protocol fish community survey on record, conduct fish, crayfish, and mussel surveys at a limited number of sites. Use standardized statewide sampling methods to sample fish, crayfish, and mussel populations (*tools 3.b., 5.a., 5.b.*). Consider conducting at least one sample in each major tributary in the watershed, and at least one sample to represent each stream order present in the watershed. This sampling will provide staff with a current overview of aquatic community health, species CPUE, sport fish population size structure, species distribution in the watershed, and may result in new species of concern locations and densities. This sampling may lead staff to discover previously unknown impairments within the watershed and may also provide an outreach and education tool to promote stakeholder enthusiasm for protecting the watershed's aquatic life.

Since the most recent Heritage record is over 15 years old, return to the Heritage point locations and sample to determine presence/absence of the species of concern. If information exists in Heritage about the level of effort or gears previously used to sample, attempt to repeat this effort (if feasible) to gain insight into possible change in CPUE since the last sample. Also use statewide standardized sampling techniques for SOCC taxa to establish baseline data at Heritage locations.

Recruit the three Stream Teams in your watershed to determine their interest in establishing long-term monitoring stations within the watershed. Establish long term Stream Team monitoring stations in major tributaries and upstream and downstream from major disturbances (i.e., the two large grazing operations, urban areas). Try to get volunteers to commit to sampling macroinvertebrates at each monitoring station at least twice a year, once during the spring sampling season (mid-March through mid-April) and once during the fall sampling season (mid-September through mid-October) (*tool 4.c.*).

Repeat biological surveys at regular intervals as determined by management objectives, the demand for current data, and resources available.

Physical-

Consider the management objectives, data need, and time and resources available and select an appropriate physical habitat sampling protocol to meet your specific needs. If staff decide that

detailed physical measurements are not necessary, draw a habitat sketch of your sampling reach and record detailed field observations of stream habitat sampled. At all surveyed sites, take several photos of the stream substrate, channel, banks, and riparian conditions.

Use the physical assessment data collected by the Stream Teams to monitor for changes in the physical habitat (*tools 6.b., 7.a.*)

Chemical-

At your baseline survey sites for fish, crayfish, and mussels, measure a limited number of water quality variables (temperature, pH, dissolved oxygen, conductivity, etc.) and other variables of interest that reflect your management goals and that you have the resources available to sample.

Use Stream Team volunteers to collect water quality data at the same monitoring stations where macroinvertebrates are being sampled (*tool 8.b.*). Encourage volunteers to obtain the highest level of Stream Team water quality monitoring training. Conduct specific training to certify Stream Team volunteers in nutrient sample collection and collect nutrient samples upstream and downstream of suspected sources. Due to limited funding, the use of volunteers will be able to provide data from more locations that have been specifically chosen by staff to monitor strategic locations within the watershed.

Possible monitoring activities to evaluate progress of management objectives

1. Management Objective: Restore aquatic organism passage

- a. Field (In-channel) monitoring activities
 - i. Take several photos in the upstream and downstream direction of the stream crossing before and after crossing replacement (*tool 2.a.*).
 - ii. If a species of conservation concern is present in the watershed, consider doing standardized fish population surveys for this species upstream and downstream of the crossing before and after stream crossing replacement (*tools 3.a., 3.b.*).
 - iii. If data concerning change in habitat is desired, consider measuring stream habitat variables such as width, depth, substrate composition, and flow velocity/discharge, etc. upstream and downstream of the crossing. Consider using a standardized measurement protocol depending on the detail needed and anticipated use of data (*tool 6.b.*).
- b. Office-based monitoring activities
 - i. Keep record of the number of stream crossings replaced and miles of stream length reconnected (*tool 2.b.*).

2. Management Objective: Maintain current level of fish, crayfish, and mussel community diversity and health

- a. Field (In-channel) monitoring activities
 - i. Conduct periodic evaluations of fish, crayfish, and mussel communities using standardized community sampling protocols (*tools 3.b., 5.a., 5.b.*). The number of sampling sites and time between surveys depends on long-term data needs and resources available.
- b. Office-based monitoring activities
 - i. Data entry and analysis associated with field data collection.

- 3. Management Objective: Maintain presence of Species of Conservation Concern (SOCC) at known locations and increase known locations of SOCC throughout the watershed**
 - a. Field (In-channel) monitoring activities
 - i. Conduct periodic surveys for SOCC using standardized taxa specific sampling protocols (*tools 3.a., 5.a., 5.b.*). The number of sampling sites and time between surveys depends on long-term data needs and resources available. Survey known Heritage locations and also new sites that have not been surveyed previously.
 - b. Office-based monitoring activities
 - i. Data entry and analysis associated with field data collection. Enter SOCC locations into the Heritage database.
- 4. Management Objective: Maintain desirable CPUE and size structure of smallmouth bass and rock bass populations**
 - a. Field (In-channel) monitoring activities
 - i. Conduct periodic evaluations of smallmouth bass and rock bass populations using standardized population sampling protocols (*tool 3.a.*). The number of sampling sites and time between surveys depends on long-term data needs and resources available.
 - b. Office-based monitoring activities
 - i. Data entry and analysis associated with field data collection.
- 5. Management Objective: Increase riparian buffer to 100 feet wide on 10 miles of stream**
 - a. Field (In-channel) monitoring activities
 - i. Take several photos in the upstream and downstream direction of the riparian zone prior to buffer installation and at regular intervals following installation (*tool 2.a.*).
 - ii. Randomly sample areas to determine the percentage of tree plantings surviving to age five (*tool 2.b.*).
 - b. Office-based monitoring activities
 - i. Keep record of acres and miles of riparian buffer established or enhanced. Record number of landowners involved and number of conservation easements established (*tool 2.b.*).
 - ii. Use aerial photos of areas to track changes in riparian buffer growth and riparian land use change over time (*tool 1.a.*).
- 6. Management Objective: Provide outreach to landowners regarding septic tank maintenance and livestock exclusion**
 - a. Field (In-channel) monitoring activities
 - i. Use data collected by Stream Team volunteers to monitor trends in nutrients and other water quality parameters throughout the watershed and upstream and downstream from suspected sources (*tool 8.b.*). For each sampling date, note recent precipitation events that may cause a spike in nutrient levels due to runoff.
 - ii. Take several photos of the riparian zone and stream bank before and after livestock exclusion (*tool 2.a.*).
 - iii. Track the number of educational and outreach programs given to watershed residents (*tool 2.b.*).
 - b. Office-based monitoring activities

- i. Keep record of the number of septic tanks pumped and replaced through funding with your cooperator (*tool 2.b.*). Record and map the location of septic tank improvement sites. This may correspond with Stream Team water quality data collected above.
- ii. Keep record of the miles of livestock exclusion fencing installed, the number of livestock units excluded, and the number of landowners participating in livestock exclusion practices (*tool 2.b.*).

7. Management Objective: Monitor for changes in storm water runoff from urban areas

- a. Field (In-channel) monitoring activities
 - i. None
- b. Office-based monitoring activities
 - i. Keep record of number and area of urban storm water reduction projects (pervious surface projects, rain gardens, detention basins, bioswales installed, etc) (*tool 2.b.*).
 - ii. Use aerial photos and GIS data layers to monitor change in land use over time (*tool 1.a.*).
 - iii. Use available USGS gage data downstream of urban areas to monitor for trends in the change of peak stream discharge over time (*tool 7.a.*).

8. Management Objective: Clean up sinkhole dump sites

- a. Field (In-channel) monitoring activities
 - i. None
- b. Office-based monitoring activities
 - i. Keep record of number of sites cleaned up, tons of trash removed, and number of landowners and/or volunteers participating (*tool 2.b.*).
 - ii. Maintain map of cleaned up sinkhole locations (*tool 2.b.*).

MISSOURI DEPARTMENT OF CONSERVATION

STREAM IMPROVEMENT CERTIFICATION POLICY

Subject: Qualification required to diagnose stream problems and to design and install stream improvement work.

Policy: It is the joint intention of Design and Development Section, Fisheries, Forestry, Private Land Services, and Wildlife Divisions to ensure that stream improvement work is conducted by qualified personnel. This policy applies to all stream improvement activities that receive funding or technical assistance from the Department. Any employee responsible for developing or approving stream improvement projects on public or private flowing waters must be certified to make recommendations at a specified level. This policy ensures: stream improvement efforts are conducted wisely and efficiently, the Department's credibility in stream improvement is enhanced, our liability risk is reduced, and staff competency is maintained.

Certification

Guidelines: Personnel must meet the following to design or approve stream improvement projects on public lands or give technical advice for such projects on private lands.

Employees:

- A. must have successfully completed coursework in stream hydraulics, hydrology, geomorphology, holistic stream management, bank erosion control, and instream habitat development. This coursework may be obtained from the Stream Unit's Stream Management Workshop, college courses or other approved sources.
- B. must pass the required test administered by the Stream Unit.
- C. Who are responsible for developing project plans and providing stream recommendations must also demonstrate, within two years of completing Sections A and B requirements, proper field application of the subject material. MDC staff must submit a total of eight approved project plans, landowner recommendation letters, and/or 404 stream mitigation plans to Stream Unit technical staff for review and approval. Stream Unit personnel will provide written comments on these documents within seven working days and will provide approval when the documents are ready for distribution. Upon satisfactorily completing, the employee is no longer required to have non-rock related projects or recommendations approved by the Stream Unit.

Stream Improvement Recommendation Levels:

The following levels have been developed to protect the landowner, biologist and the Department from unnecessary problems and possible liability. These are:

A. Regional approval of stream improvement plans and recommendations.

Who can approve? : Regional Supervisors who have passed the test identified in Certification Guidelines, item B above.

B. Vegetative recommendations for riparian corridor management.

B1. When the request was made for forest or wildlife improvements.

Who can make recommendations? : MDC employees

If recommendations were generated by a request for assistance with improving the forest resource or improving wildlife habitat and these recommendations do not include clearing of the stream corridor, recommendations should be handled in the normal process of the Division making the recommendations. If they include clearing of the corridor or major modifications of the corridor area, the Stream Unit will be contacted.

B2. When the request was made as a stream contact or the original contact turned to stream issues.

Who can make recommendations? : MDC employees who have completed the coursework outlined in **Certification Guidelines, item A.**

If recommendations only pertain to corridor vegetation management then prepare the letter, obtain required supervisor review, mail the letter to the landowner and mail a copy to your Stream Services contact for inclusion into their files. Your Stream Services contact will also review the letter before mailing if requested.

C. Use of biotechnical practices.

Who can make recommendations? : Certified staff (those not yet certified refer to Certification Guidelines, item C).

If a biotechnical practice is recommended, then prepare the letter, obtain required supervisor review, mail the letter to the landowner and mail a copy to your Stream Services contact for inclusion into their files. Your Stream Services contact will also review the letter before mailing if requested.

D. Structural using rock or requiring engineered practices.

Who can make recommendations? : Professional Engineers; inside MDC or contracted outside.

If your recommendation involves the use of rock, only general recommendations regarding rock based stabilization can be made by MDC staff who are not licensed engineers. The policy, Criteria for Using Rock-Based Bank Stabilization & Grade Control on Public and Private Lands (in Appendix of the Stream Management Workshop notebook) should be reviewed before recommending rock-based stabilization.

There is one exception, certified staff can recommend reinforced stream crossings as long as the crossings are installed at bed level and meet the other criteria for crossings. Your Stream Services contact should be consulted on your first five crossing recommendations.

MDC engineers are available to design stabilization projects if cost-share money is involved.

E. Other.

Who can make recommendations? : Certified staff.

When the project you are recommending does not fit any of the above descriptions and may have an impact on the stability of the channel (i.e. log jam removal, bridge replacement or removal, dam removal, etc) Stream Services staff should be included in the decision making.

Revocation of Qualification:

- A. Qualification will be revoked if an individual demonstrates gross negligence in conducting stream improvement duties. This will be decided by the Stream Unit and D & D Engineers with input from Region Supervisors.
- B. An individual may be requalified by completing all of the requirements listed in Sections A, B and C of the Certification Guidelines listed above.

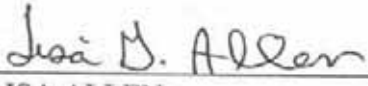
Missouri Department of Conservation Criteria for Using
Rock-Based Bank Stabilization & Grade Control on
Public and Private Lands


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7/20/04
DATE


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7/22/04
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Criteria for Using Rock-Based Bank Stabilization & Grade Control on Public and Private Land

Introduction: Streams are dynamic and constantly adjusting to changes in water discharge, sediment discharge, energy and vegetation. When rock-based stabilization techniques are used, it limits the stream's ability to adjust. Also, the use of rock can drastically move the channel, resulting in damage to private and public property.

The Department should not endorse rock-based stabilization unless one of the four following conditions is met:

- 1) The unstable reach cannot be stabilized using biotechnical methods (i.e. toe too deep for a tree revetment) and the eroding reach is located in a much longer reach that is stable.
- 2) The instability is threatening or degrading one of the following:
 - a) critical habitat for a rare, threatened or endangered species or
 - b) a rare habitat (aquatic or terrestrial) in the watershed, and a biotechnical solution is not feasible
- 3) The rock-based stabilization is being installed as a demonstration of a technique that meets Regional objectives.
- 4) The rock-based stabilization is for the purpose of grade stabilization.

In addition to meeting one of these four conditions, each rock-based stabilization project shall meet all of the conditions listed below:

- 1) The Department should not be cost-sharing on a project where high-value property is threatened. A Department Engineer may comment on a project involving high-value property as long as the Engineer recommends that the landowner obtain the services of a Professional Engineer for the final design. High value property is defined as structures including buildings, bridges, roads, utility lines, etc.
- 2) The stream should be vertically stable. The exception to this is if the project is for the construction of a grade control structure.
- 3) The Department is obtaining corridor protection in exchange for our assistance. Protection includes livestock exclusion and, where applicable, revegetation. The exception to this is when livestock access to the stream is via a "Reinforced Stream Crossing" or a "Limited Access". Width of corridor protection shall be as per the Department's cost-share agreement.
- 4) The reach must not be generally unstable. For example, selecting one bank out of dozens that have been destabilized by channelization would not be appropriate, nor would attempting rock-based stabilization where, over a long period of time, the channel has been frequently shifting its location.
- 5) Financial feasibility and fiscal responsibility must be considered. All projects should include a landowner cost share. The financial feasibility of a project will be based on the resource protected, the MDC priority of the watershed and the cost.
- 6) The project has gone through the following review and approval process:

- a) A field visit conducted by a stream certified MDC employee
- b) Recommendation by Stream Unit Staff for engineering assistance
- c) Screened/reviewed by Fisheries Regional Supervisor
- d) Designed or approval of design by a D&D Professional Engineer. This would include designs by Professional Engineers outside of D&D. D&D engineer may develop conceptual design including estimated project cost and request confirmation of funding and landowner commitment prior to completing final design.

For other considerations, see the Stream Stabilization Technique Evaluation Process (STEP 1), as printed in the MDC's Stream Management Workshop Notebook.

Frequently Asked Questions

There are too many decisions yet to be made for this appendix to have a conclusion section. Therefore, the summary will be composed of frequently asked questions section, which should frame topics for future discussion and a couple of examples of plans for watershed monitoring. To provide some structure to this FAQ section, it will be subdivided into major topics.

Non-Wadeable Streams

I need the equivalent of RAM protocols for a non-wadeable stream. What is available?

EPA has recently promulgated in-channel methods for use in non-wadeable streams. Possible methods can be found at <http://www.epa.gov/owow/riverssurvey/index.html>. The field operations manual used for the National Rivers and Streams Assessment (non-wadeable in 2008 and wadeable in 2009) is available at (<http://www.cpcb.ku.edu/research/html/NRSA.htm>). Additionally, the USGS in cooperation with the National Parks Service developed a protocol specific to the Ozark Plateaus which includes sampling fish communities, collecting water quality, habitat, and stream discharge data (<http://pubs.usgs.gov/of/2007/1302/>). Further follow-up is needed to establish standardized MDC protocols.

Headwater Streams

I need the equivalent of RAM protocols for a headwater stream. What is available?

The RAM protocols have been used at headwater sites and seem to be successful. Further investigation into using the RAM protocol on headwater streams should be continued. Additional protocols are available from EPA (<http://www.epa.gov/eerd/manual/headwater.htm>). Further follow-up is needed to establish standardized MDC protocols.

Determining impairment and limiting factors:

How is the cause of impairment determined?

Missouri DNR has the responsibility to determine if a water body is impaired. The decision is based on methods and criteria that are in their Listing Methodology (<http://www.dnr.mo.gov/env/wpp/waterquality/303d.htm>).

The streams in my watershed are not impaired according to DNR, so how do I determine the most important factor to work on?

If a stream is not impaired, it is very difficult to determine the most important problem on which to focus efforts. However, whatever work can be done to improve connectivity, establish wooded riparian corridors, and reduce the input of sediment and nutrients will provide long-term benefits for the stream.

What can be done to keep track of any changes in the watershed?

Several possibilities exist, including: periodically collecting water chemistry data at fixed locations in the stream, periodically collecting macroinvertebrate data using VWQM protocol at fixed locations in the watershed, scanning through new aerial photography as it becomes available, and reviewing new 404, NPDES, etc. permits in the watershed.

How many sites will I need to document ecosystem health?

This really depends on the stated objective and what protocols are determined to best track potential changes. Currently, the only tool being evaluated is the RAM fish sampling protocol which is being reevaluated by Matt Combes in Resource Science; recommendations will be forthcoming. Further work is needed to evaluate other protocols. Ultimately, this decision will probably be determined by the resources available.

What is the appropriate periodicity of monitoring?

This is a question which has not yet been adequately addressed. The appropriate periodicity will vary depending on the objective and the method(s) being used to measure that objective. It will also depend on whether the measurement is meant as a periodic check of the current condition or is intended to detect a trend. As has been mentioned elsewhere in this appendix, the time lag associated with BMP implementation must be considered. The realities of staff time and funding will also be part of this decision.

Data Management

With multiple watersheds and multiple sites, this will create a lot of data. Where will the data be stored?

A centralized database with the ability for each region to input and retrieve data will undoubtedly be needed, but this has not yet been adequately addressed.

If we have centralized data management, don't we need a common set of protocols that are used for all sites?

There need to be common protocols, but not every protocol has to be done at each site or in each watershed.

If high level protocols are used at some sites, does a common data management system require that the high level protocols are used at all sites?

The high level methods are not appropriate for measuring all objectives, especially given differences in time and money involved. Therefore, the data management system must be designed to record the data and the methods used for collection and analysis.

Fish

Since my overall goal is to at least maintain current ecosystem health, don't I need to be monitoring the fish populations?

Assessment of the fish community is one way to measure for a long term objective of monitoring ecosystem health. In some cases, other measures may be more appropriate.

Benthic Macroinvertebrates

Do I need to sample for the benthic macroinvertebrates?

Sampling the benthic macroinvertebrate community can provide another essential piece to the overall picture of ecosystem health. In some cases, other measures may be more appropriate.

Which sampling protocol is appropriate?

Available resources, what level of data acuity is needed, how much staff time is available, and the level of expertise in invertebrate identification available should be thoroughly considered when answering this question. What are the goals and objectives being addressed? The choice of sampling protocols should be based on staff response to these questions and thoroughly discussed through the respective supervisory chain prior to implementation.

Physical Habitat

How do I decide about using a physical habitat assessment method?

There are many stream habitat assessment protocols which have been developed over the years and range from quick and qualitative to highly quantitative and labor intensive. Many of the methods used in the U.S. can be found at (<http://assessmentmethods.nbii.gov/index.jsp?page=methods>). MDC personnel have experience with two protocols available for assessing the physical habitat at sampling locations (Tools 6.a., 6. b.). Regardless of which method is chosen, it will be difficult to obtain valuable data unless a crew is well trained. To select a physical habitat method, goals and objectives should be developed and discussed and the time required to conduct surveys should be carefully considered. Staff should also be able to answer "yes" to at least one of the following questions:

1. Will it help to determine management activities?
2. Will it help to familiarize staff with the streams?
3. Will it help in communicating stream issues with stakeholders?
4. Will it help in long-term tracking of watershed conditions?

Water Quality

How do I work with DNR on a possible water quality problem in my watershed?

The Resource Science Aquatic Health Unit can provide guidance on this and can potentially serve as a liaison, if needed.

What are some 'standard' parameters that could be easily tested for that could provide some essential baseline information?

Some basic water chemistry parameters that can be monitored on a seasonal basis could include water temperature, dissolved oxygen, pH, specific conductance, and turbidity. Sampling for specific nutrients could also be included, and if possible should reflect DNR's parameters. In some situations, other parameters may be important such as ammonia, phosphates, metals, chlorides, etc. These should be handled on a case-by-case basis depending on potential stressors and available resources.

How do I track changes in stressor levels like ammonia?

Direct measurement of changes in stressors is expensive in terms of time and equipment because of all the variations that occur seasonally, and as a function of flow. This type of assessment is best used by regulatory agencies where impairment has been defined or is being investigated.

Are there benefits to getting Stream Team Volunteer Water Quality Monitors involved?

Volunteers provide several benefits including: more eyes on the stream, more public buy-in, and the potential for trained people to provide supplemental water chemistry and macroinvertebrate data to help track possible new problems.

Are ST Volunteers Monitors available in all watersheds?

No, there are not volunteers in all watersheds. However, support and training for new teams are available from MDC and DNR Stream Team staff. This provides a potential opportunity to facilitate the involvement of citizens from these watersheds.

Hydrology

How do I monitor changes in hydrology?

Hydrology is one of the most important aspects of the stream ecosystem. Alterations to the natural flow regime can cause significant declines to the resource. However, because of the great variability in natural flow regimes, approximately 20 years of baseline data and 20 years of post-alteration data would be needed to be certain to determine that a change in hydrology has occurred. That, of course, is 20 or more years late to try to improve the situation. Therefore, a proactive advocacy for hydrology related BMPs is much more productive than monitoring.

What about significant hydrologic alterations like water withdrawals or dams?

These would be handled as major issues under the current Fisheries Division policy and potential future MDC policies, in cooperation with Policy Coordination Unit and RSD staff.

There aren't any USGS gages in my watershed; can't I do some monitoring with dataloggers?

The use of dataloggers for measurements related to short-term objectives may be appropriate. However, dataloggers create a lot of data and are prone to a number of problems. Again, the limited period of record will be a primary concern. The choice of data collection protocols should be

thoroughly discussed with Stream Unit and RSD staff and through the respective supervisory chain prior to implementation.